NATIONALS MOFFET AND STOUT WINNER

MODEL AIRPLANE NEWS

13th Year of Publication

OCTOBER 1941
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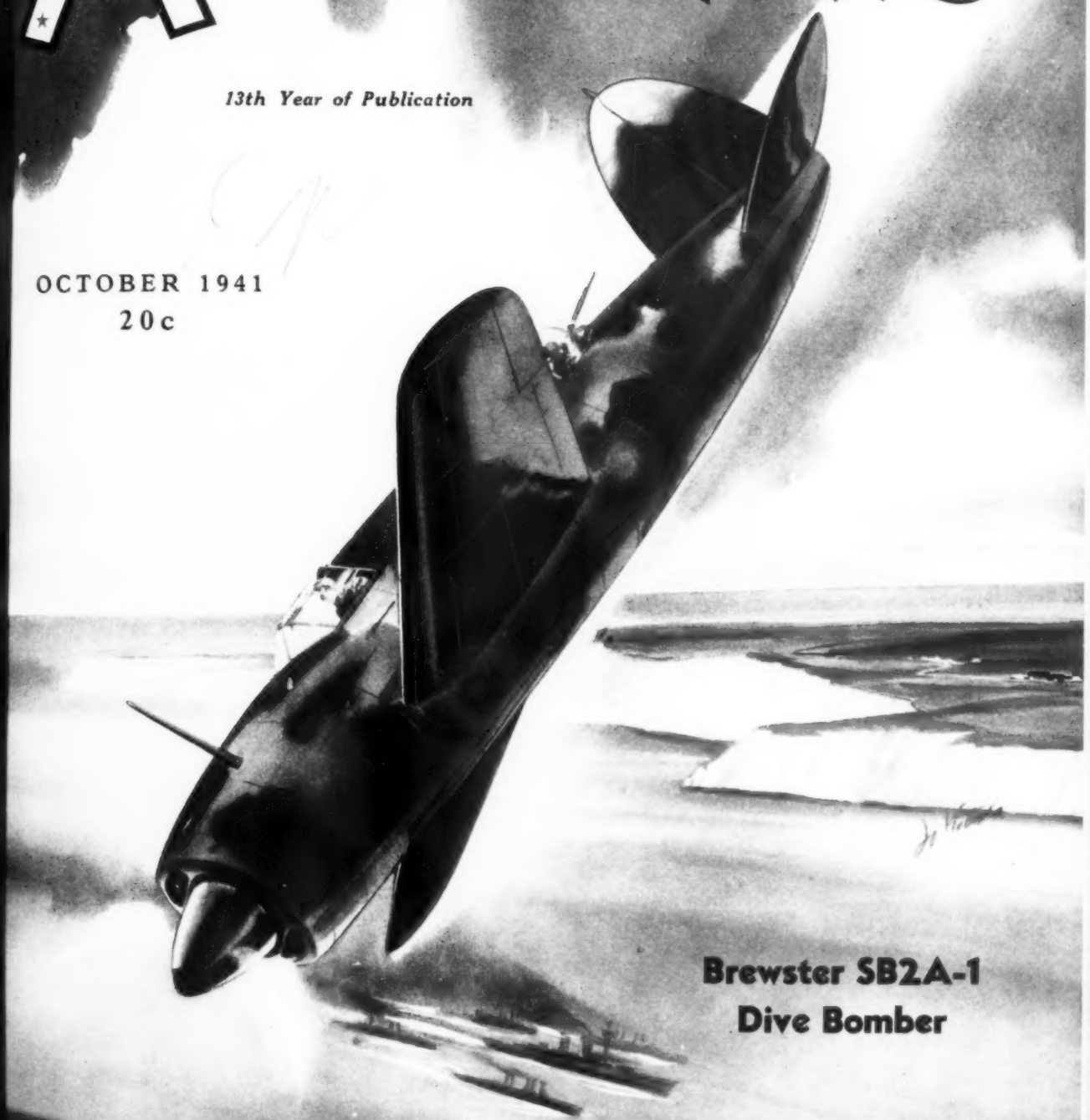

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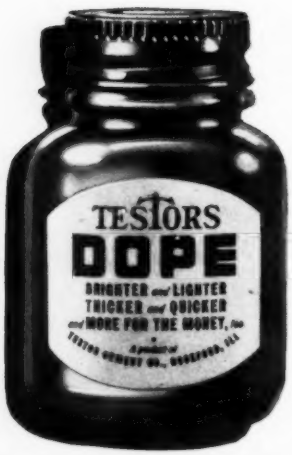

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ONE OF THESE historic beacons is a Rock on the forbidding New England coast, a shrine established by the Pilgrims, where the light of religious freedom shines eternally. Another is Old North Steeple in Boston where gleamed signal lanterns to inform the Minute Men of the direction taken by the enemy —it is still a reminder that eternal vigilance is the price of Liberty.

ON A PASTORAL bridge at Concord, embattled farmers fought—their muskets flashed a message of hope around the world whose reverberations are still echoing in the hearts of enslaved peoples. In a country church in Virginia, Patrick Henry spoke heroic, epic words that burn with meaning yet.

THESE FLAMING BEACONS, set by inspired men, guide us even today on our traditional course—toward the goal of peace, prosperity and unfettered individual liberty. Constant reminders, are these unquenchable fires—for all to see. And to our future navigators they are a warning to fly as the arrow flies—on the beam.

The Editor

13TH YEAR OF PUBLICATION

MODEL AIRPLANE NEWS

OCTOBER, 1941 VOL. XXV, No. 4

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Edited by
Charles Hampson Grant

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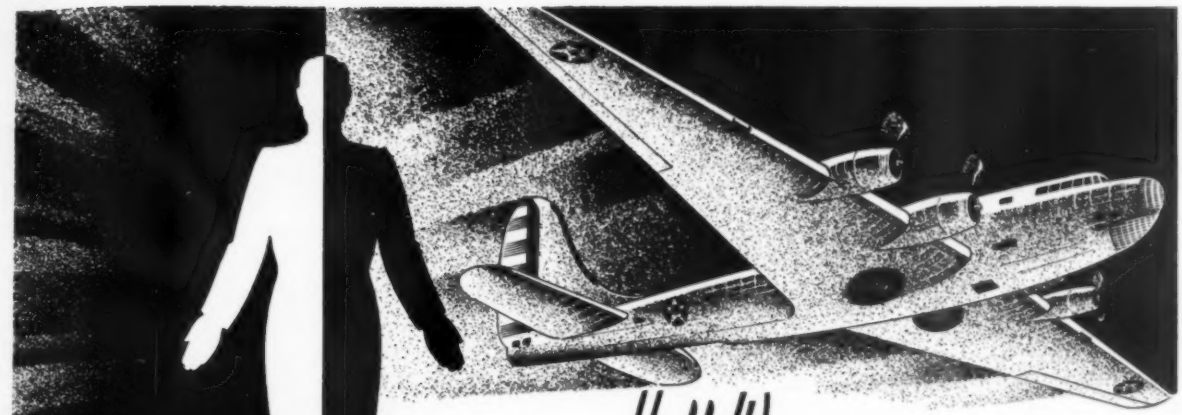

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WHILE the great temporary emergency forces aviation to give jobs to many quickly and inadequately trained "single phase" men, these jobs will last only as long as the emergency that caused them. There has never been a finer opportunity for you to embark upon a secure, interesting and profitable career in aviation. BUT only if you train thoroughly for the responsibilities of that career and choose the right school for your training. The leaders of aviation who have made it THEIR career know from long experience what training is required to fill responsible supervisory positions and they know that Curtiss-Wright Technical Institute graduates are—and for many years have been—thoroughly qualified to fulfill the industry's most exacting requirements. You are only fooling yourself if you try to fool them with halfway training.

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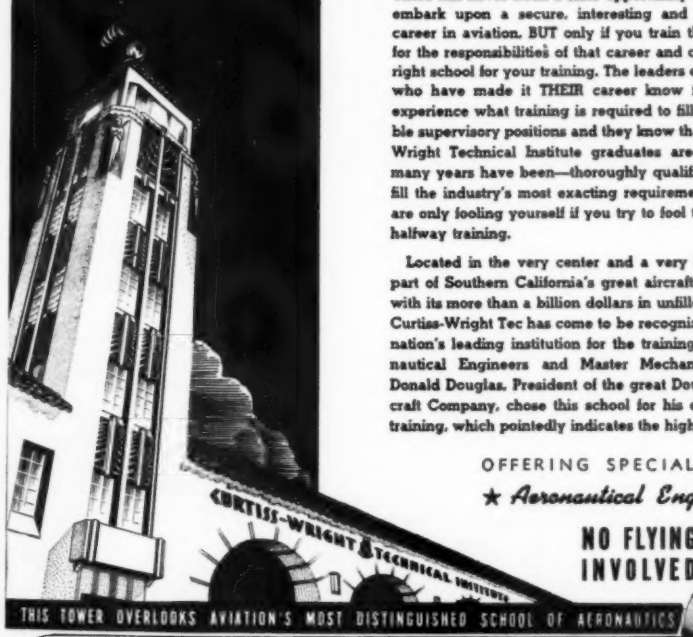

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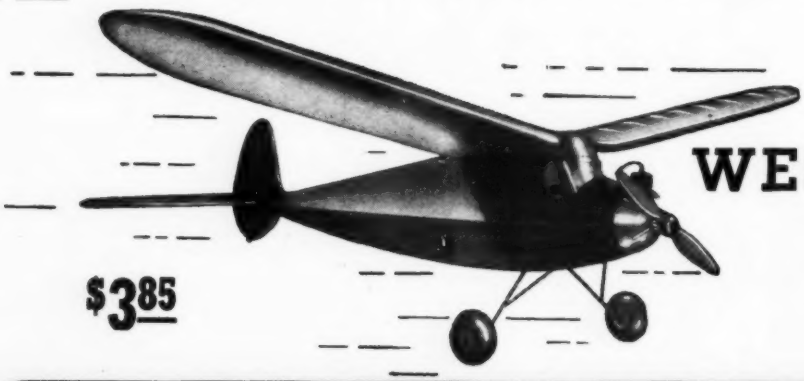

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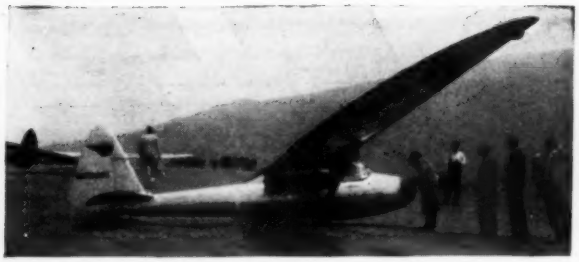
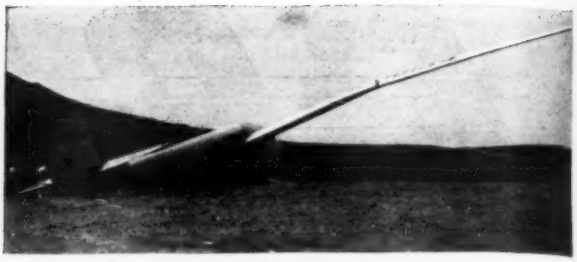


The Aero I.T.I.-G.2 sailplane of super-fine structure



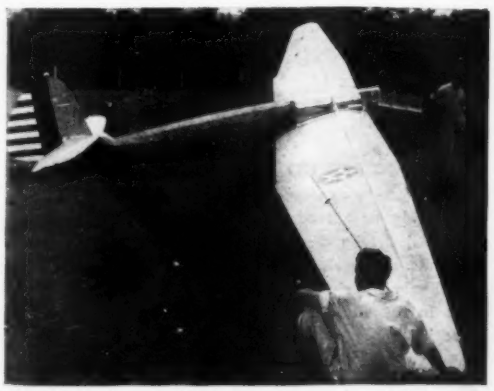
The Zanonia sailplane is one of the fastest

SILENT WAR WINGS

WHEN the Germans held their "first annual soaring event" at Crete this year, the American sailplane enthusiast was in his glory. He had been saying right along that the U.S. Air Corps should first train its men in sailplanes before jumping into the powered "stuff," and that the Air Corps should also use them in "whispering" attacks upon the enemy by either dropping bombs or landing in the enemy territory and personally supervising the destruction of anything that was there to destroy. It was like a miracle coming true. The bug-on-sailplanes could scarcely believe his eyes when, right in front of him, were big, bold newspaper headlines that went something like this, "German Sailplanes Attack the Island of Crete!" He probably had not the slightest idea where Crete was located, but there was a certain "I told you so" strain of thought filtering through his brain.

At once the U.S. Army Air Corps decided to take another look at one of those things . . . what do you call them? . . . sailplanes? The American sailplane manufacturers, of which there are several well organized outfits, immediately envisioned big business ahead. But after the Air Corps took "one more look" there was still that very dampening conclusion that sailplanes were not an effective weapon. However, experiments will still be carried on with gliders and sailplanes, and it is our belief that if they were employed in conjunction with parachute troops to haul the heavier equipment they may be of use.

We gathered all the information that appeared in the news about Germany's excursion to Crete and put it in a big pile. Then we pounced on it, squeezed it and even "snuck up from behind" to endeavor to "scare" up a little information that would make good wholesome sense. All we could find, however, of any reliable value was that Max Schmeling and a bunch of sailplanes had arrived at Crete and the English had involuntarily decided to embark for other regions. Then we were not even sure of those facts. Just how the sailplanes were transported or towed, whether in trains of ten or fifty, how many men were carried, whether they landed in the water, in among trees or on their backs, remains in the realms of mystery or misery. Perhaps when Schmeling can "book a rematch" with Joe Louis we will be able to get the full details. The truth might be that one mad Russian became involved in a thermal he could not handle, and the next thing he knew he was landing at Crete with a few Germans from Greece chasing him to find



The U. S. Army glider that competed at Elmira meet. (Three Lions)

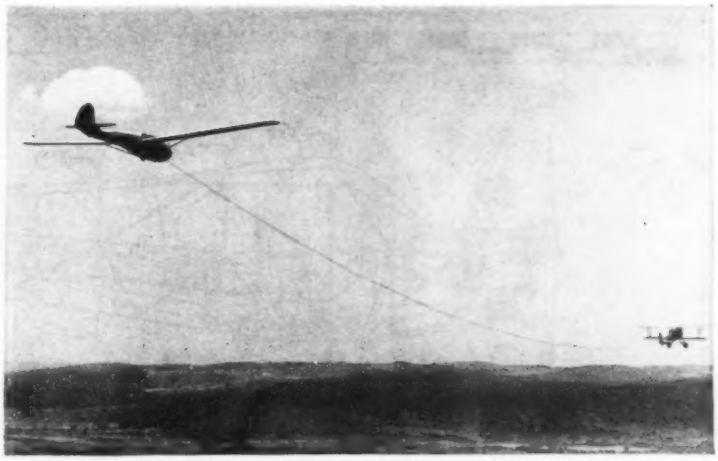
Nose of the I.T.I.-G.2. Note the smooth skin and streamline cockpit cover

The Super Albatros with "pod" fuselage and tail boom

This efficient sailplane was flown recently by Herman Stiglmeier on its "run-in" flights at Elmira

Four Ford V-8-driven blowers provide artificial wind so the tethered glider flies without "going places." (Acme)

A German glider powered by a small motor with which they are experimenting. (Acme)



A plane with a U. S. Army glider in tow. (Three Lions)

Possibilities of Gliders in War and Highlights of Soaring Planes That May Form the Nucleus of Uncle Sam's Silent Squadrons

By ROBERT C. MORRISON

out what it was all about. Well, anyway, we have no desire to go over there and look into the matter personally, so we will have to let time disclose the details.

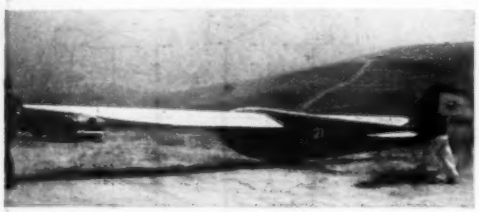
The big fact remains: If enemy gunfire is not too severe, sailplanes could follow parachute troops and efficiently supply them with the necessary machine guns, bullets and "box lunches."

Sailplanes have the advantage of being able to land in a very small area. We, ourselves, have found that landing in among a herd of cows seems to have no disturbing effect on them, though the ship's occupants might be on the nervous side. We have also found that it is possible to take a typewriter along in one and type out a news story while aloft, perhaps the first time that has been done. But whatever has been done, sane or otherwise, we think there is a lot more that can be accomplished in the design of new sailplanes, especially larger ones to carry big loads. The autogyro has now taken another lease on life, and it seems only fitting that experiments with sailplanes be carried out to the fullest extent to definitely prove their military value. Such experiments would not be a costly venture compared with other government projects of like nature, and the results will be highly beneficial.

Recent U.S. Air Corps sailplane activities have included towing of as many as five in a train and experimenting with training pilots by anchoring a glider so that it may only take off a few feet in a blast of air created by grouping several propellers blowing air at the front of the glider, in wind tunnel fashion.

The sport of gliding and soaring in the United States has had phenomenal success; new ships are always taking the air. A new two-place Bowlus has been flying on the West Coast. It is the usual Bowlus "pod" design, incorporating all-metal construction in lieu of plywood used in the past. The seating arrangement is in tandem, and because of the added passenger a strut has been mounted from the end of the pod to the aft end of the tail boom to give more strength. On the single place Baby and Super Bowlus Albatrosses the tail surfaces have been mounted on a full cantilever tail boom. At the moment the owner flies the ship solo until he receives his private pilot's license, then

(Continued on page 58)



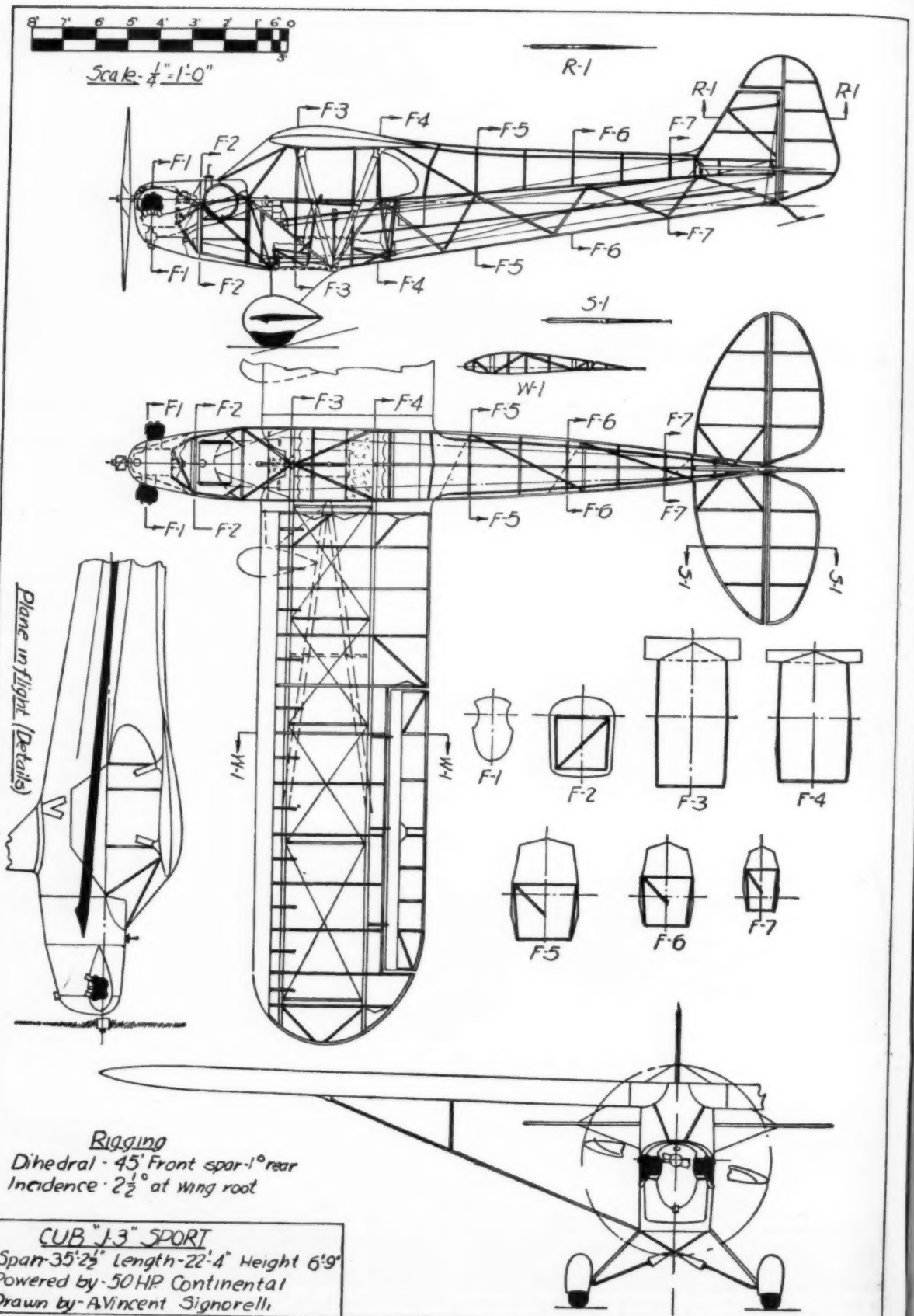
Allan Essery's glider, called the Baby Bomber, is being towed to the "takeoff"

The Volmer Jensen two-seat sailplane carries its crew side by side

The small "pod" fuselage of Stiglmeier's Baby Albatros

The two-place all-metal Bowlus sailplane has a "pod" fuselage and a strut to support the tail

Here is the Screaming Weiner, the smallest sailplane ever built. It is very fast and has slots at wing tips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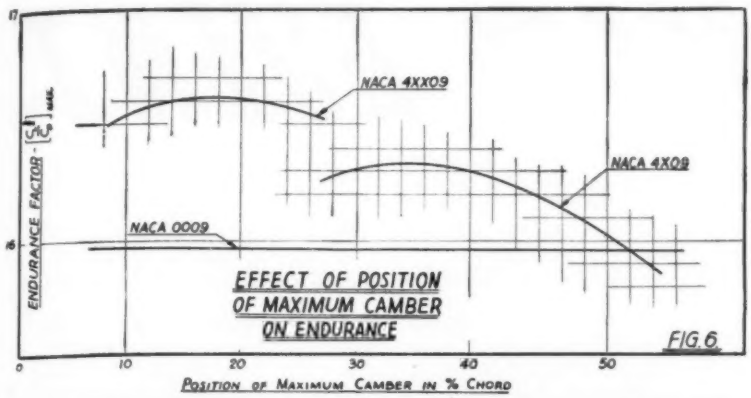
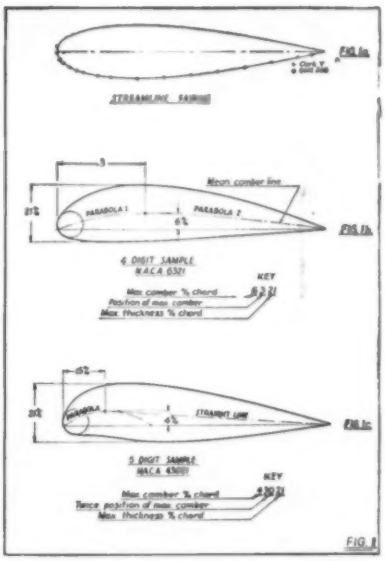
Scale- 1/4"=1'-0"
R-1
F-1
F-2
F-3
F-4
F-5
F-6
F-7
S-1
W-1
Plane in Flight (Details)
Rigging
Dihedral - 45' Front spar-1° rear
Incidence - 2 1/2° at wing root
CUB "J-3" SPORT
Span-35'-2 1/2" Length-22'-4" Height 6'-9"
Powered by-50 H.P. Continental
Drawn by-A.Vincent Signorelli



KEEP THEM UP



Development and Characteristics of Double Surface Air Foils

By COLEMAN ZOLA and ROY MARQUARDT

Part 2

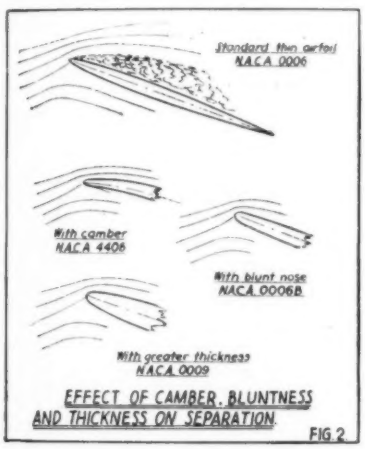
PART I (M.A.N. March '41) of this series consisted of a discussion of single-surface airfoils. If you studied our results carefully, double-surface airfoils are going to be a "snap," for all we shall do now is wrap a streamlined form or fairing around our single-surface airfoils. To further simplify the problem we shall distribute the thickness evenly above and below the single-surface so that it becomes an average or "mean camber line." Thus we have only two variables: first, the form of the mean camber line; and second, the shape of the streamlined fairing.

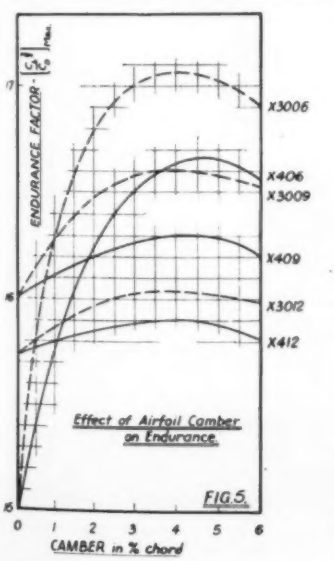
We had planned to begin our discussion with the tests made at the Burlington (Iowa) Junior College. However, the N.A.C.A. has collected such a stack of data on the subject we shall temporarily shelve our own meagre results until the discussion of scale effects. Unfortunately, the N.A.C.A. tests were made at a very high velocity-chord product. We shall show in Part III, though, that the same things occur at model speeds.

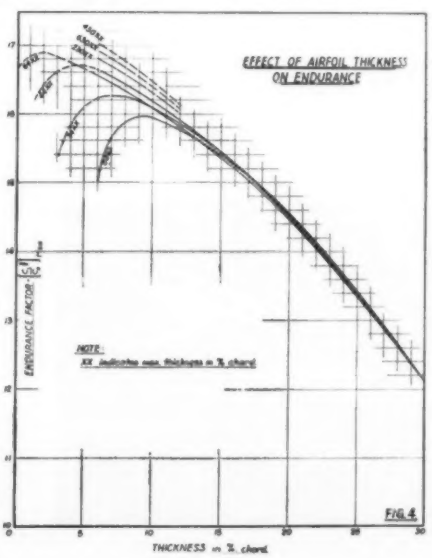
Before going into the aerodynamic results, it will be convenient to discuss the airfoil geometry and N.A.C.A. notations.

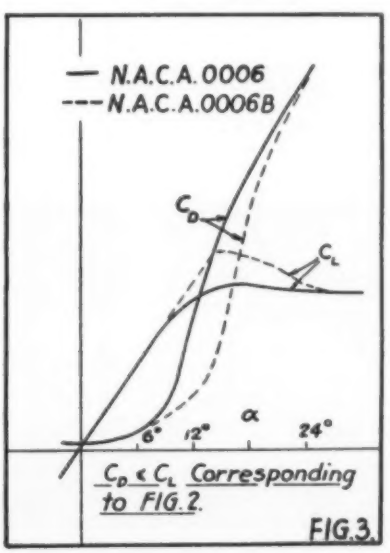
Our own tests in Part I showed the best mean camber line to be the M arc series; many of you probably noticed this was simply a combination of two parabolic segments. The N.A.C.A. has used just this shape for the now famous four number family (6412, etc.—see N.A.C.A. Report 460). The N.A.C.A. five number series (23012, etc.—see N.A.C.A. Report 610) have a mean camber line combination of parabolic and straight line segments. See

(Continued on page 48)









THE TWO EVENT

This Plane Gave the Most Sensational Performance of the 1941 National Contest—Winning Both the Stout and Moffet Trophies—The Designer Tells How You Can Build It

Ray Beaumont with the Stout and Moffet Trophies which he won by a total of four flights of the Thermal Chaser

THE evolution of the "Thermal Chaser" began when Mr. William Berry, advisor at the Woodrow Wilson Junior High School, suggested that the proper way to "break into" model aviation was to build a glider. After a little parental encouragement the glider was launched on a very successful flying career, but finally flew out of sight.

This thrill inspired the purchase of a gas model kit, which plane later placed among the first ten at one of Philadelphia's big contests. Long hours of experiment and building followed, with all types of models, including detail scale, fuselage, outdoor commercial and many others; until finally a prototype of the 1941 Moffett winner won the 1939 Philadelphia City Championship.

During this period help had been received from Mr. Berry in the design of the various planes, but many were still built from kits. It was the winning of the Class C Gas Event at the 1938 Nationals, held at Detroit, that inspired concentration on original design. Some of the planes built during the next three years won many events, a number of which were:

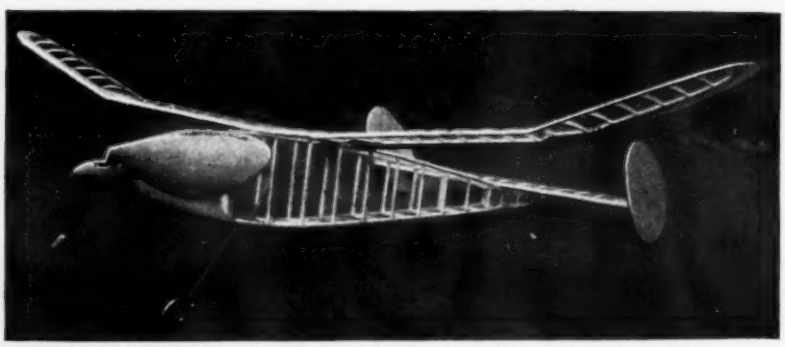
First in 1939 Quaker City Contest, Class C; 9th in Wakefield Contest, Detroit Nationals; 1st in Class B, Easton Contest, 1940; 9th in 1940 Nationals, Moffet Event; Sr. Detail Scale Championship Event, Philadelphia; two first places and a second place in the Flying Stick Event, P.M.M.A. Contest; 1st in the 1941 Flying Detail Scale Championship Event, Phila.

All of these led up to the design and building of the Moffet winner, providing the experience and ideas incorporated in this ship. The design was started early in the 1941 season and a number of months were spent in test flying, working out the various "bugs" usually present in new designs. Many planes of the design were built and test flown, but finally one was built which appeared to be superior to all others.

There were a number of factors which greatly contributed to the success of this ship; in its development many types of wings, stabilizers and construction were tried. A square type fuselage was finally selected as the lightest and most efficient. The nose was well streamlined, blending into a spinner. A one wheel landing gear was used; also a one bladed folding propeller, to reduce resistance when gliding. A cambered airfoil section was used to reduce tail load and give more buoyant effect. From tests, double rudders appeared to give greater directional stability, as well as provide ground rests to rigidly support the plane with its one wheel landing gear; this enabled unassisted takeoffs.

To obtain extreme lightness, the plane was equipped with a sparless wing; ease of construction also prompted its use. The airfoil was simple, with the undersurface approximately parallel to the upper; the leading and trailing edges serving as the spars. On tests the wing proved very efficient, giving the plane a fast climb and excellent soaring qualities, though it was not quite as stable as other sections.

By the time the Nationals took place, in July, the design had been perfected. In the Stout Event and the Moffet Eliminations the model flew out of sight on its second flight and was lost. The first flight was clocked for 6 min. 58 sec., the second for 9 min. 56 sec. Though it won the Stout Event, its loss was heartbreaking, for these two flights qualified the plane for the Moffet Final. Twenty-four hours were left to build another plane, get a little sleep and

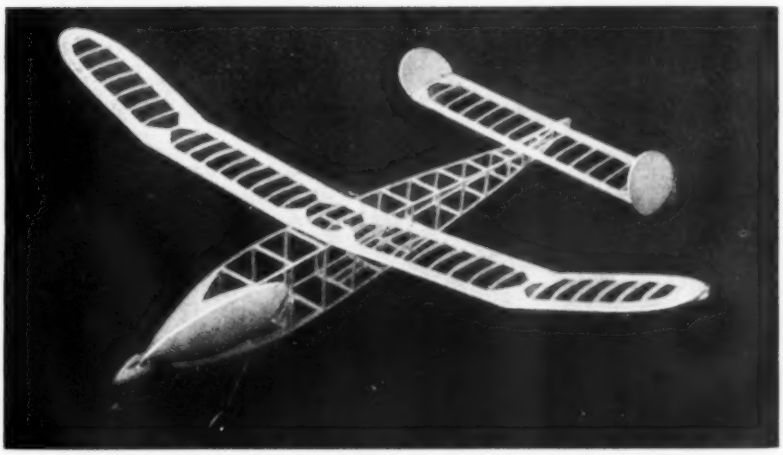


Embodying single blade prop, one wheel, twin rudders and simple structure

Beaumont with the International Moffet Trophy and winning plane

NATIONALS WINNER

By RAY BEAUMONT



The Thermal Chaser before covering. Every line contributes to efficiency

something to eat. However within that time plans were drawn, the plane built and tested ready for contest flying—the simplicity of the design contributing considerably to this accomplishment.

Apparently this is only a two-flight plane, for in the Moffet Final Event, after making one flight of 8 min. 56 sec., it flew out of sight after 9 min. 51 sec. This, however, was sufficient to win the Moffet Finals.

The record of this little ship shows it to be a consistent winner, and not merely one of those "thermal winners." The time taken to build this little plane will never be wasted, for it will consistently win for you.

Construction

First draw full size plans; to build the ship from scaled down plans usually is very unsatisfactory and troublesome. Construct the fuselage, assembling the sides. It is advisable to construct both fuselage sides at the same time, one above the other. When the cement is thoroughly dry separate them with a razor blade.

Using your full size plans, first pin the longerons to the working drawing, then insert the uprights and diagonals. Make certain all parts are cut to the correct size and placed at the proper stations. Be careful not to stick the pins through the wood, as this weakens the part; stick them into the board on either side of the frame braces to hold them in place.

Now that the fuselage sides are dry, join them by cementing them at the tail, letting the joint dry thoroughly before joining them at station 6, shown on the plans. The nose block is cemented in place at station 1, which will bring the fuselage to the proper shape. After cement is dry insert the rest of the cross braces.

Place the 1/8" sheeting around the nose, according to the plans; when dry, sand it perfectly round to the same size and shape as the spinner. Drill a hole in the nose block, making sure it is absolutely "dead center." Insert plywood in the fuselage tail and let dry; drill holes in the plywood to hold the 3/16" dowel stick, used as a tail hook.

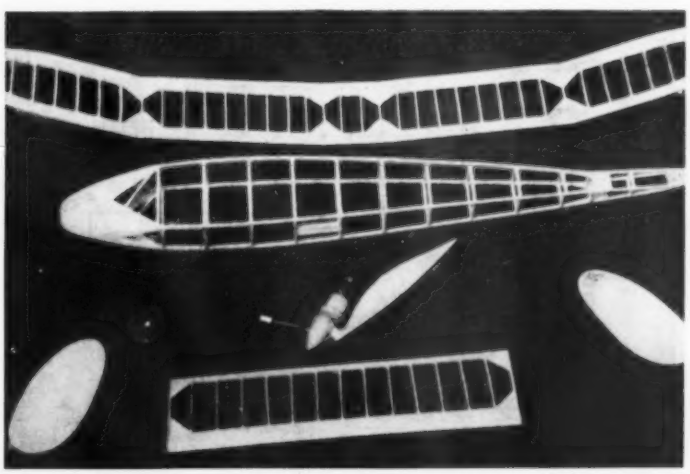
The landing gear is made of 1/16" piano wire, bent to shape as shown on the plans. It is bound to the fuselage bottom cross section at station 5. Be sure and strengthen this cross brace. Install a hook to hold landing gear and rubber band between stations 4 and 5; this band retracts the gear. The fuselage is now ready for sanding; remember the finish of any model is really put on when you are sanding, so try to give it that smooth finish before applying tissue. Shrink the paper with a fine spray and apply three coats of clear dope.

The rudders are cut from 1/16" sheet and clear dope applied for high polish.

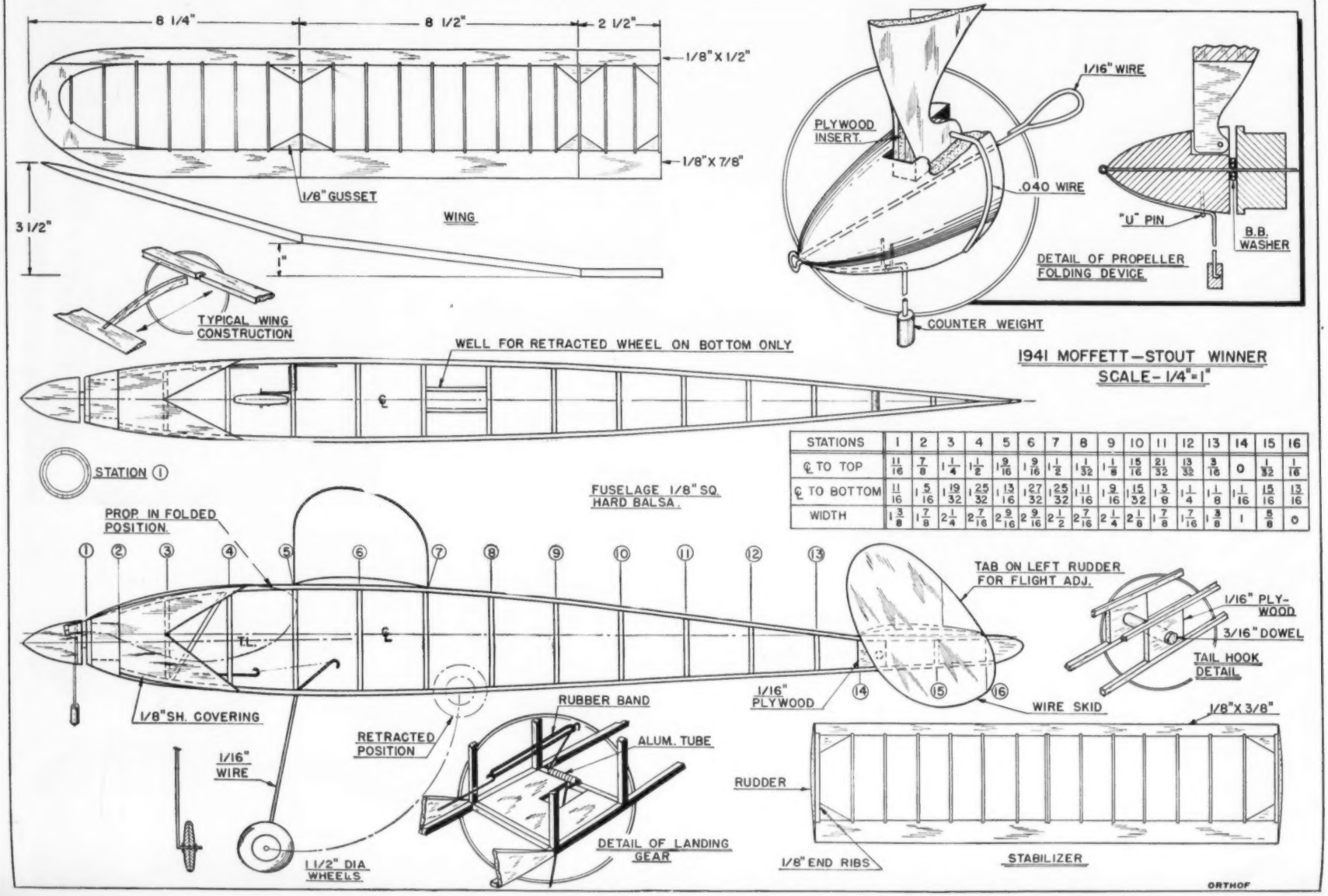
Cut the stabilizer leading and trailing edges from 1/8" sheet; notch both edges to hold the ribs in position, as there are no spars on either wing or stabilizer. Ribs are made of 1/16" sheet and when properly glued in the notches will have less tendency to warp. When dry apply tissue, after sanding thoroughly. Pin stabilizer to a level surface and apply one coat of nitrate dope.

(Continued on page 72)

The Thermal Chaser and its designer



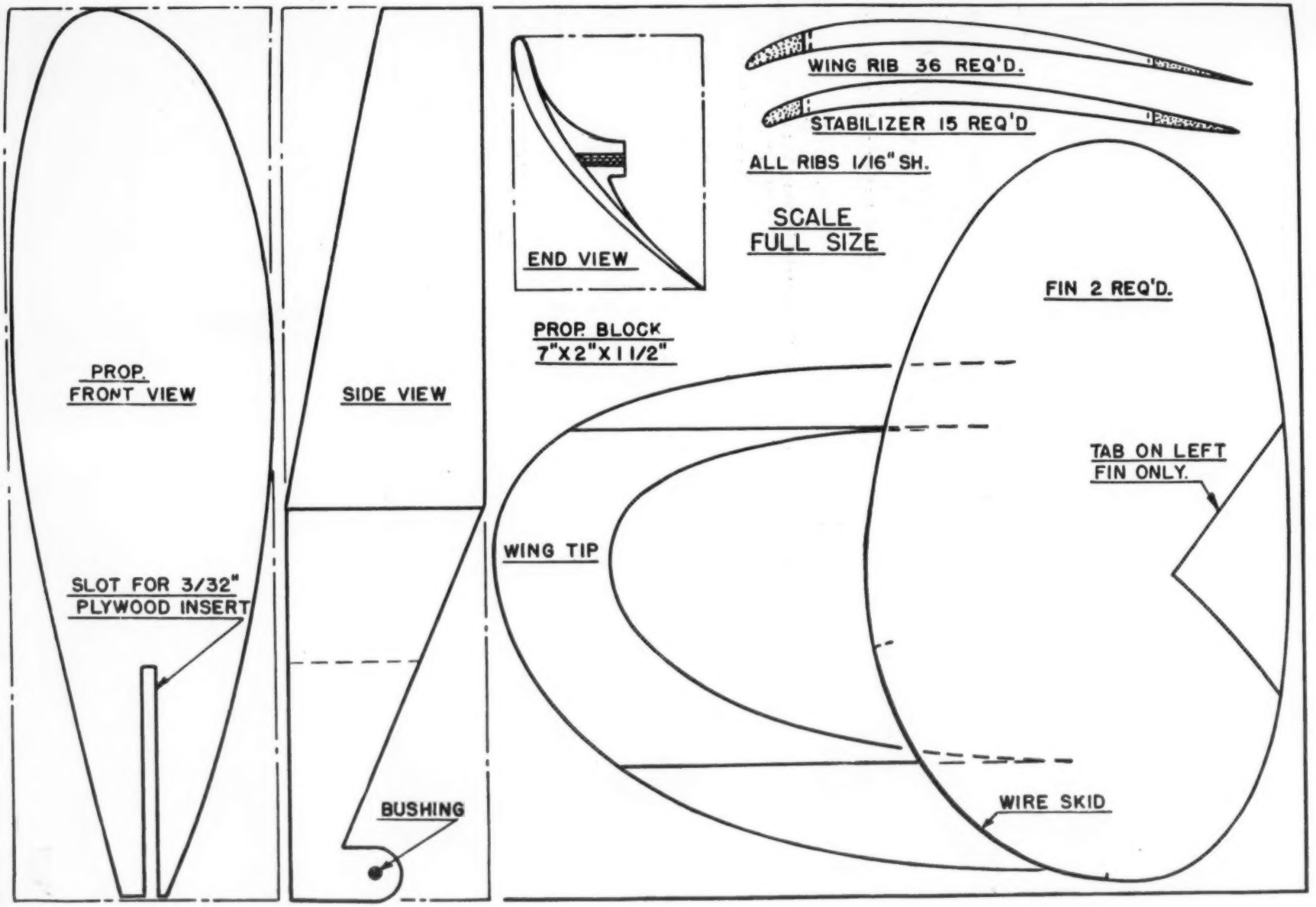
The ship is made in units that are easily assembled



STATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
℄ TO TOP	11/16	7/8	1 1/4	1 1/2	1 9/16	1 9/16	1 1/2	1 1/32	1 1/8	1 15/16	2 1/32	1 13/32	1 3/16	0	1/32	1/16
℄ TO BOTTOM	11/16	1 5/16	1 19/32	1 25/32	2 13/16	2 13/16	2 27/32	2 25/32	2 11/16	2 9/16	2 15/32	2 3/8	2 1/4	2 1/8	2 1/16	2 15/16	2 13/16
WIDTH	1 3/8	1 7/8	2 1/4	2 7/16	2 9/16	2 9/16	2 1/2	2 7/16	2 1/4	2 1/8	1 7/8	1 7/16	1 3/8	1	5/8	0

WHEELS

ORTHOF



1. Leo Bailey launches his "scale" on an official flight

2. Launching a fuselage model of unusual design. (Not a stick model)

5. Ed Cenknov's scale Skyfarer

WINGS AT THE

Planes of Latest Design and Personalities

THE 1941 Nationals displayed a greater variety of designs than ever before; apparently model builders have become tired of "sticking to" orthodox lines and are endeavoring to incorporate original ideas.

The greatest design similarity was noted in gas models; unquestionably this is due to rules governing plane specifications and flying, the chief factor being the 20 second engine run. With this short run, it becomes necessary to create a ship that will climb to the greatest height in this length of time, and then continue to store up duration with a long glide. Thus the designer has a problem of creating, in effect, a "skyrocket glider." The desire for this type performance does not inspire the design of planes similar to big craft, but merely one type of ship.

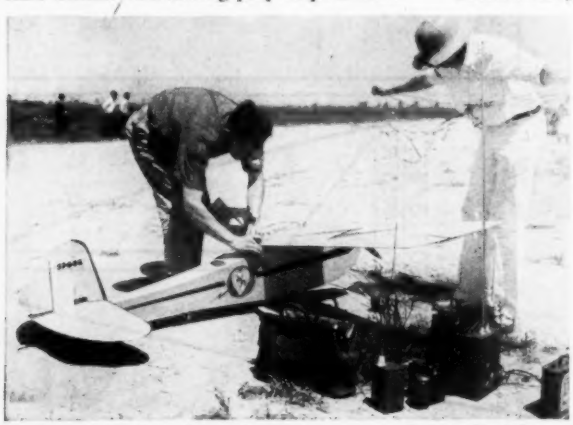
This, in our view, has handicapped gas model flying and has met the displeasure of a great number of builders. Something ought to be done about it!!

One suggestion is reduce the motor run in order to prevent ships from being lost, but this is merely a variation of the same tune; for the objective then will be to climb as high as possible with the shorter run. The average plane now "sticks" its nose up at a steep angle and rises nearly vertical. To simulate the performance of a full scale craft the model should fly more nearly horizontal.

If this is the objective it may be at-

6. Robert Annes displays a fine example of a scale Cessna. The folding prop helps duration

7. A builder stores energy in his fuselage model motor, shown in picture 11



8. John Ault and Merritt Caton tune up their radio job

9. Irwin Briese makes ready his V-tail gas job

3. Ken Harker's and Dick Symonds' 12 ft. 6 in. radio plane

4. A builder repairs his model at the trailer camp

NATIONALS

Seen at the 1941 National Model Plane Meet

Pictures By HAROLD KULICK

tained by leaving the motor run at 20 seconds rather than reducing it, but extending and increasing the weight per cubic inch of engine displacement from 80 oz. to 120 oz. Such a plane would have to demonstrate its aerodynamic efficiency in order to win a contest and at the same time the chances of thermal flying would be reduced greatly.

In a few words it means that the power expended during flight is less for any given weight of airplane, having the same effect as reducing the motor run. Reducing time of motor run reduces the power expended but doesn't obtain the desired effect.

If you like the suggestion given here, write to us and to the Academy of Model Aeronautics, Willard Hotel, Washington, D. C., expressing your views.

The Flying Scale Model Event was one of the most interesting at the contest; a great variety of ships were displayed. Attention to detail and scale measurements were emphasized by crediting 70 points to this feature; 30 points being allowed for flying qualities.

In picture 1 Leo Bailey releases his scale Culver Cadet for a final flight. This was a popular design and a beautiful flier.

10. Henry Hyman and his model with slots

11. Ralph Gerdielee and Kan Kantasuk hold tight while the model is wound

12. Ed Swenton cleans his motor after a dive into a swamp

13. Mr. and Mrs. S. H. Harper prepare their plane for flight

14. Charles Siegfried tunes up his radio job (3rd place)

15. C. Johnson's stick model

Best flying "tailless" we ever saw

17. Chester Lanzo with his scale Aeronca

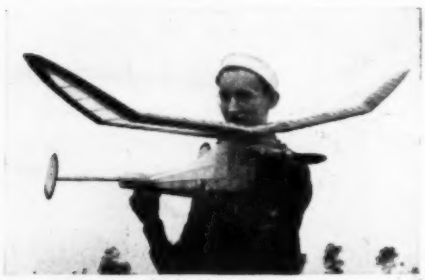
Picture 5 shows another scale model: A Skyfarer with its builder, Ed Cenknov. This model illustrates the trend of many builders to twin rudders; it has been definitely established this improves the model's longitudinal and directional stability and insures a very steady flight, provided other features, such as dihedral, are in correct proportion.

Picture 6 shows still another scale model: a Cessna built by Robert Annes. This ship featured a folding propeller, which improved the glide duration.

Picture 2 shows a Takoma builder launching his unique type fuselage ship. Though in fact a stick, it is classified as a fuselage model because of the large crossection of the vertical wing support. This illustrates a case in which the rules have gone astray, producing a plane which is not an orthodox fuselage ship, as can be noted.

In picture 7 you see the builder winding the job before its flight.

The plane appears in picture 11, held by Ralph Gerdielee and



18. A one-wheeler of fine design

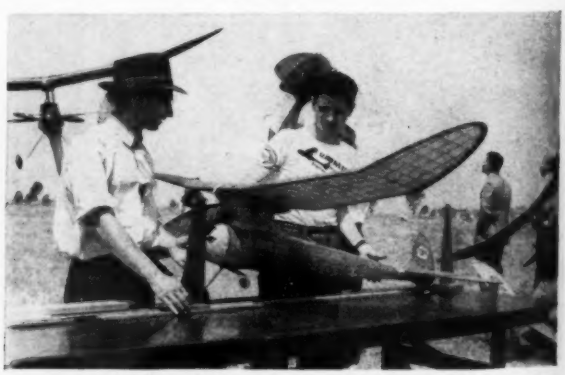
19. John Clemens' "pod" gas model

20. Jim Cahill is still growing—sideways

21. Beaumont and 44 in. "scale"

22. A high aspect ratio stick powered soarer

23. E. Arthur placed 2nd with this radio plane



24. Measuring fuselage at processing table

25. Marchi helps Cunningham with his indoor plane

26. Carl Goldberg assists Jim Clem, who flew models for the first time

27. George Sass launches his ship

Ray Kantasuk.

Most contestants adhered to orthodox design; the wing rested on the fuselage top. The winner of the Cabin and Moffet Events, Ray Beaumont, had an excellent example of this type ship. In his case stability was attained by keeping the fin area low relative to the thrust line. His ship was rigged so that it flew normally with the tail depressed.

The Radio Control Event was more thrilling than ever before; a great number of designs were displayed.

Picture 3 shows Ken Harker's and Dick Symonds' 12 ft. 6 in. radio plane, which attained considerable success. Apparently large ships are not conducive to precise control, however.

Another radio job, shown in picture 8, was built by John Ault and Merritt Caton. It is nearly a duplicate of the successful Good Brothers plane—a modified KG. It was powered by an Ohlsson 60, giving an excellent demonstration.

A typical scene at the radio field is shown in picture 14. Here Charles Siegfried of Kansas, who placed third, prepares his plane for flight.

The winner of this event was Jim Walker, who put on a remarkable demonstration. His ship was of the high-wing type with a span of about 7 ft. In picture 33 you see the control box which he devised; to a large extent this contributed to his successful flights. The control stick shown at the center was operated similarly to the stick

(Continued on page 46)

28. Two old friends meet; Bill Winters of "Air Trails," right, and Charlie Grant of M.A.N., left, greet each other on the field, while Al Lewis, left, smiles approvingly

29. (Right) The Junior Aviation League of Boston with the Megow Trophy it won for high-point club score, under the leadership of Gunnar Munnick

30. Henry Cole with his fuselage job. The body is made of bulkheads of multiple stringers

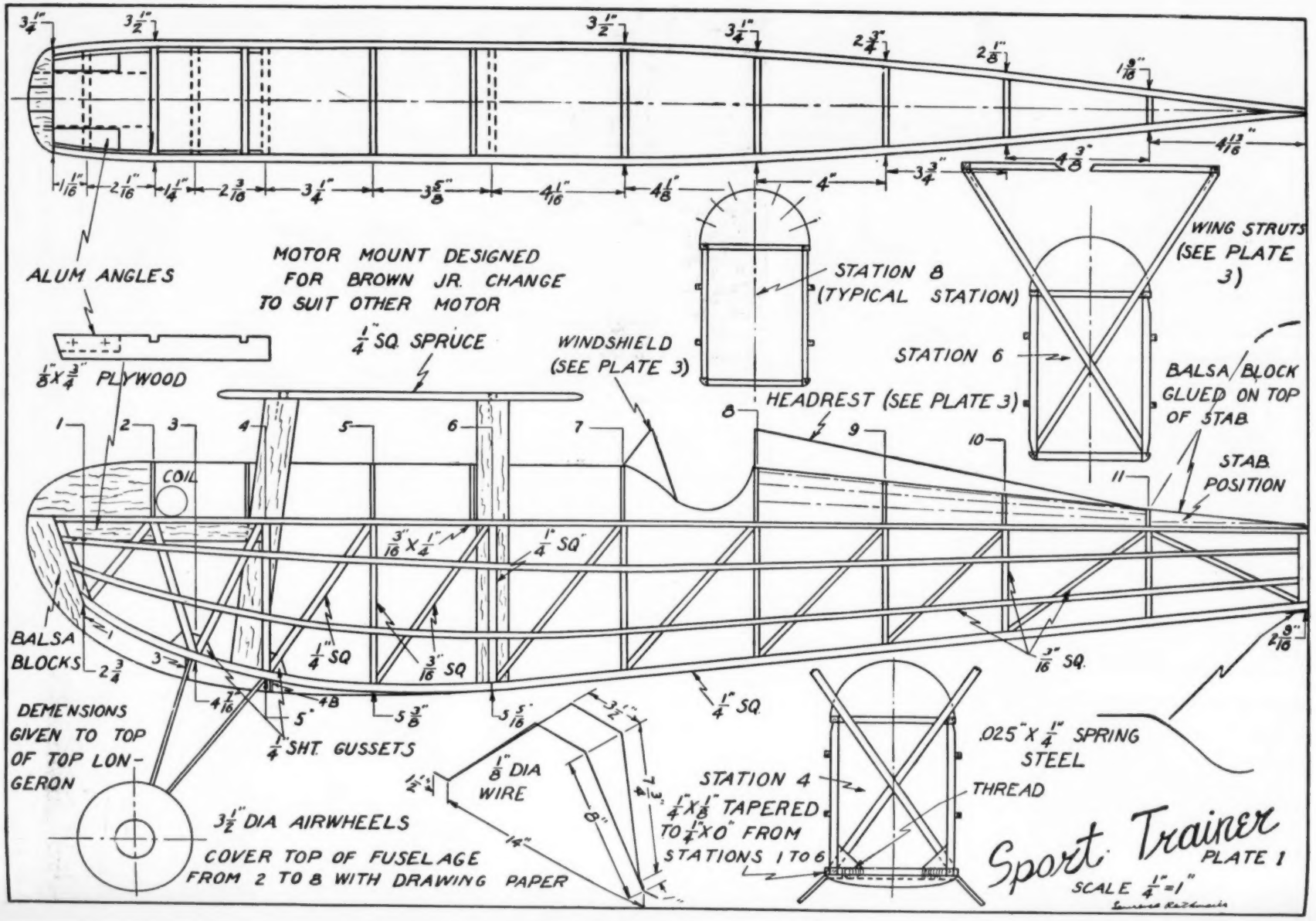
31. Ray Bagdon with his novel inverted V-tail fuselage model

32. Eric Anderson displays a novel fuselage model with wedge-shape nose

33. Jim Walker controlled his radio plane with this unique control box.

34. Gas jobs of various ships were displayed; here's one with a "low-chested" fuselage

35. Ralph True's cabin-type pusher gas job. It flew well


ALUM ANGLES
MOTOR MOUNT DESIGNED FOR BROWN JR. CHANGE TO SUIT OTHER MOTOR
1/8"X3/4" PLYWOOD
1/4" SQ. SPRUCE
WINDSHIELD (SEE PLATE 3)
STATION 8 (TYPICAL STATION)
WING STRUTS (SEE PLATE 3)
STATION 6
HEADREST (SEE PLATE 3)
BALSA BLOCK GLUED ON TOP OF STAB.
STAB. POSITION
COIL
3/16"X1/4"
1/4" SQ.
BALSA BLOCKS
1/4" SQ.
3/16" SQ.
3/16" SQ.
1/4" SQ.
DEMENSIONS GIVEN TO TOP OF TOP LONGERON
1/4" SHT. GUSSETS
1/8" DIA WIRE
STATION 4
1/4"X1/8" TAPERED TO 1/4"X0" FROM STATIONS 1 TO 6
.025"X1/4" SPRING STEEL
THREAD
3 1/2" DIA AIRWHEELS
COVER TOP OF FUSELAGE FROM 2 TO 8 WITH DRAWING PAPER
Sport Trainer
PLATE 1
SCALE 1/4"=1"

"OLD TRUSTY"

How You Can Build and Fly One of the Most Sturdy and Reliable Gas Models—Perfectly Designed

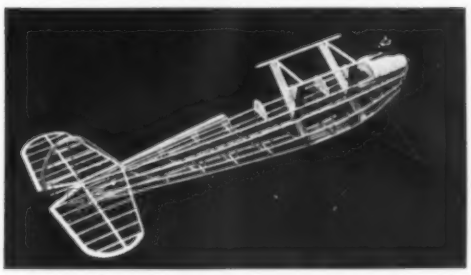
By LAWRENCE REITHMAIER

THE main factors influencing gas model design are: stability, rate of climb, gliding angle and ruggedness; to which we may also add appearance or resemblance to full size aircraft. Since much time and money is expended in the construction of a gas model, each of these qualities should be included in any design considered for a future project.

Now let's see how the Sport Trainer measures up to our requirements. First of all, it does look like an airplane. Of course the cockpit may be a little out of date in this age of cabin ships equipped with heaters, overstuffed seats, and chrome-plated door handles, but it contributes a great deal towards realism. Our ship also has a two-wheel landing gear (now who ever heard of a full size airplane with only one wheel?) and a fuselage shape which could belong to a full scale plane.

The completed plane—simple, sturdy, stable and a consistent performer

The frame is light yet beautifully designed

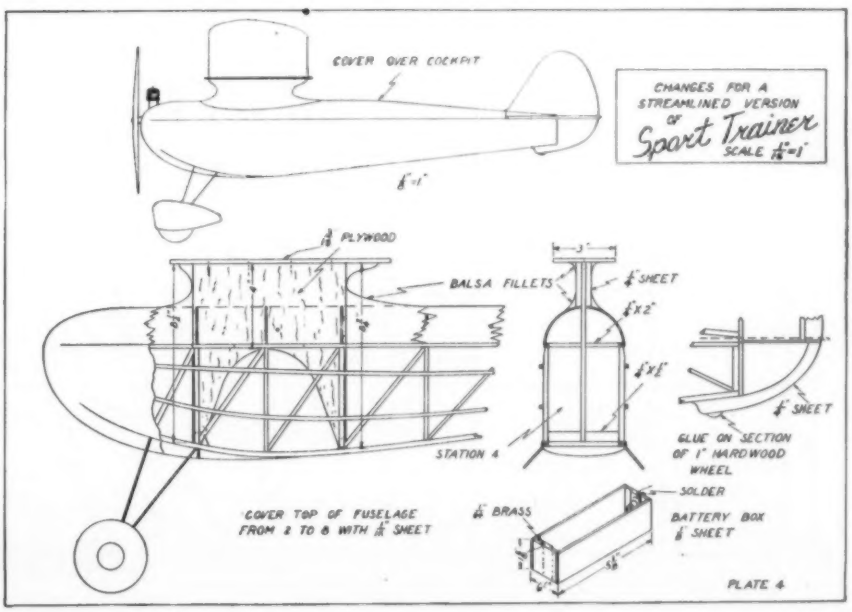


If you were building models just for their appearance you would not be reading this article, so now we will discuss the more important qualities of the Sport Trainer; which, of course, are its flying characteristics. Although it was tested on a windy day, it flew perfectly on the first flight, needing only slight adjustment for circling. It has a very steep climb and a glide that would make any self-respecting soarer "green with envy."

The Sport Trainer also possesses the most important factor to be considered in any airplane design: Stability. Stability is as important to a gas model as are wings, for without wings it will not fly, and without stability it may fly—but not for long. Spiral diving is the bugaboo of gas models, and probably has accounted

(Continued on page 52)

Going up!! Though rugged, it has a steep steady climb



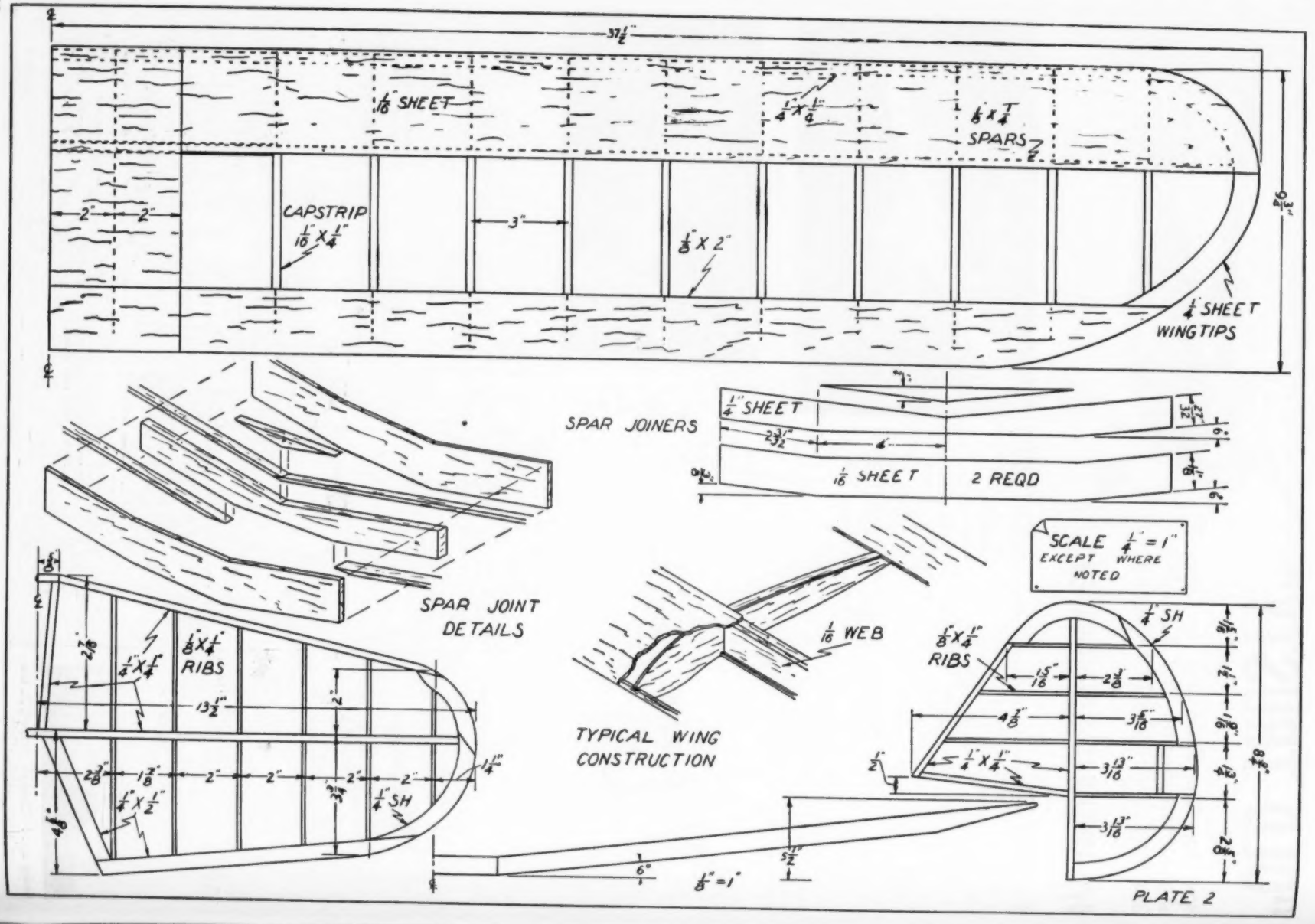
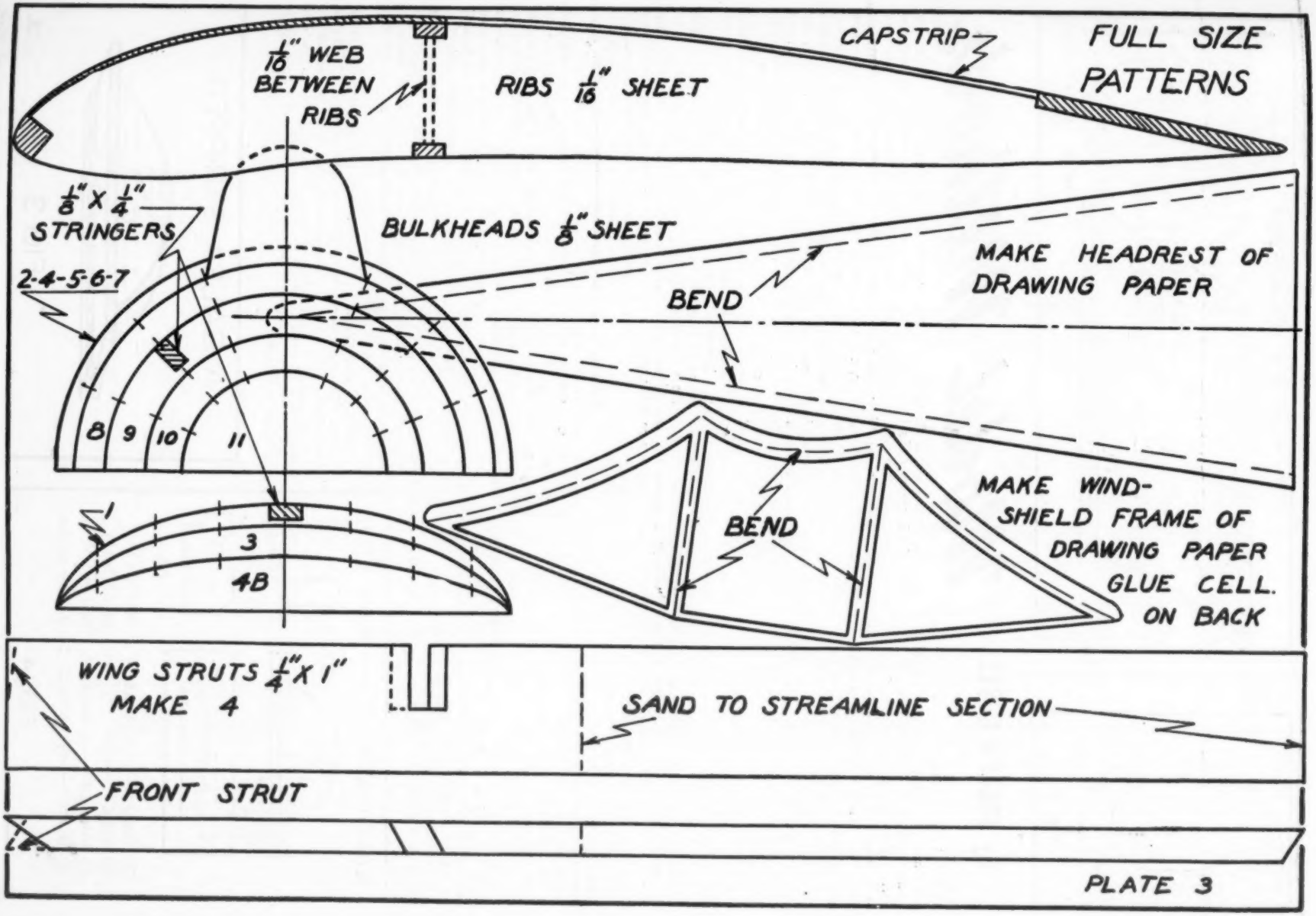
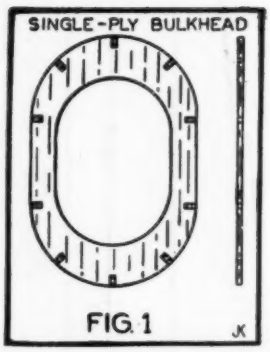
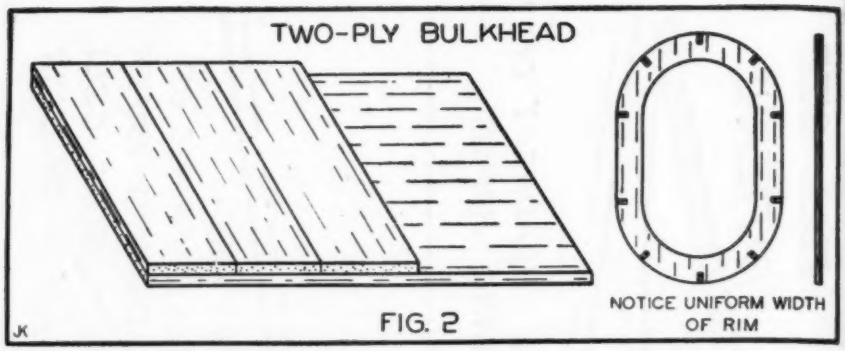

37½"
1/16" SHEET
1/4" X 1/4"
1/8" X 1/4"
SPARS
9¾"
CAPSTRIP
1/16" X 1/4"
2"
2"
3"
1/8" X 2"
1/4" SHEET
WINGTIPS
SPAR JOINERS
1/4" SHEET
23/32"
2 3/32"
4"
1/16" SHEET
2 REQD
SCALE 1/4" = 1"
EXCEPT WHERE NOTED
SPAR JOINT DETAILS
1/8" X 1/4" RIBS
1/4" X 1/4"
2 7/8"
13½"
2"
2 3/8"
1 3/8"
2"
2"
2"
2"
1/4"
1/4" X 1/2"
1/4" SH
1/16" WEB
TYPICAL WING CONSTRUCTION
1/8" X 1/4" RIBS
1/4" SH
15/16"
2 3/8"
4 1/8"
3 5/16"
1/2"
1/4" X 1/4"
3 13/16"
3 13/16"
1/8"
1 1/2"
1 1/8"
1 3/4"
2 5/8"
8¼"
1/8" = 1"
PLATE 2

PLATE 2


FULL SIZE PATTERNS
1/16" WEB BETWEEN RIBS
RIBS 1/16" SHEET
CAPSTRIP
1/8" X 1/4" STRINGERS
2-4-5-6-7
BULKHEADS 1/8" SHEET
MAKE HEADREST OF DRAWING PAPER
BEND
8
9
10
11
1
3
4B
BEND
MAKE WIND-SHIELD FRAME OF DRAWING PAPER GLUE CELL. ON BACK
WING STRUTS 1/4" X 1" MAKE 4
SAND TO STREAMLINE SECTION
FRONT STRUT
PLATE 3





Model Methods

By JOSEPH KOVEL

WELL, scale model enthusiasts, the problem of making accurate bulkheads, formers, etc., has been solved! The best part of it is that you do not have to mutilate your magazine in order to do the job. Credit Mr. Ernest J. Roth of Boston, Mass., for evolving the following method:

Take the sheet of wood from which you are going to make the bulkhead or former, give it a light coat of cement; then, before it has had time to dry lay it on the bulkhead printed on the magazine page. Press down firmly for about ten seconds or so, just so that the cement has time to soften the ink and the wood has time to absorb this ink. Then carefully take the sheet balsa off the magazine page. The result will be an impression on the balsa sheet that is almost as clear as though it had been put there by a printing press. One thing you want to be careful about is not to move the balsa sheet about once you lay it over the printed bulkhead, as this would cause a rather blurred impression.

This method not only reinforces the bulkhead due to the thin coat of cement it acquires, but it also preserves the plan in the magazine. Another boost for this method is that it is possible to get more than one impression—just in case you don't get a perfect one on your first trial.

In order to make rib, prop blade or other templates, use a sheet of paper for the impression, instead of the sheet balsa. Then, when the impression has been made, glue the paper on either a sheet of cardboard or on a thin sheet of metal. Now, with a pair of shears and a file, if necessary, cut and file the template to shape.

When making bulkheads or formers for flying scale or other models the usual procedure up-to-date has been to make them out of a single sheet of 1/16" sheet balsa, or whatever thickness the plans called for. In order to retain sufficient strength in them it was necessary to make the top and bottom of the bulkhead rather wider than the sides if the grain of the wood ran vertically. If the grain of the wood ran horizontally across the face of the bulkhead, it was necessary to make the sides of the rim rather wider than the top and bottom. (See Fig. 1)

A more efficient method of making these bulkheads would be to make them out of a two-ply, cross-grained 1/16" sheet of balsa. This is made by taking a sheet of 1/32" balsa and cementing another layer of 1/32" balsa to it with the grain running perpendicular to the grain of the first layer. (See Fig. 2)

The cement joint and the cross-grained wood would greatly strengthen the bulkhead, yet at the same time, the bulkhead would be just as light—possibly lighter—than the old type, as the rim could be made uniformly narrower than would be advisable when making the old type bulkheads.

This method is especially advisable when building bulkheads or formers for large flying scale or gas models.

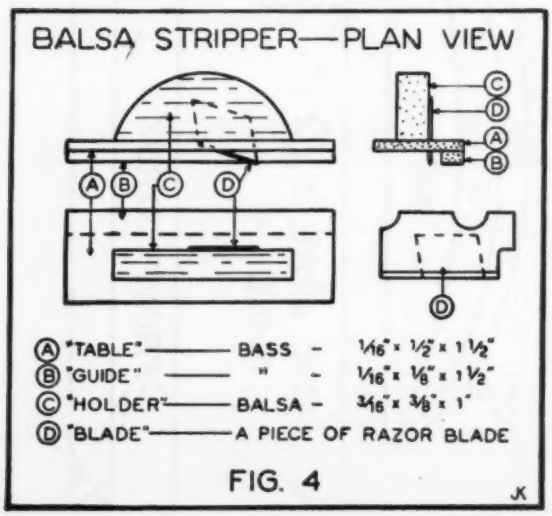
One of the most convenient tools the average model builder can have is a set of balsa strippers, or slicers. There are several adjustable strippers on the market, but none can compare with the little tool shown in Fig. 3. True, this miniature doodad isn't adjustable, but then, it is so easy to make that it is possible to make a set of six (for 1/32" strips, 1/16", 3/32", 1/8", 3/16" and 1/4") within a half hour.

The advantage of having these slicers fixed is that, should you ever need a certain size strip of wood, you know you won't have to waste time setting the tool—that the size you want is at your service whenever you need it. This device is a time and money saver in that you don't have to buy an assortment of balsa strips. All you have to do is buy the sheet wood—which is comparatively cheaper—and slice it as needed.

Following are instructions for making a 1/16" slicer (It is advisable to make the other sizes at the same time. They are made in a similar manner.): First, round up the following materials: a razor blade—the cutting tool; a strip of bass or other hard wood, 1/16" x 1/8" x 1 1/2"—to be used as the "guide;" a strip of hard wood, 1/16" x 1/2" x 1 1/2"—to be used as the cutting "table" or base; a piece of balsa, 3/16" x 3/8" x 1"—to be used as a handle or "holder;" model airplane cement, and some fine sandpaper.

With a pair of pliers break a chip off the razor blade as shown in Fig. 4. Take the piece of wood that is to be used as the "table," sand it, then give it a light coat of cement. When dry, sand it again lightly.

(Continued on page 50)


BALSA STRIPPER—PLAN VIEW
A
B
C
D
Ⓐ "TABLE"——— BASS - 1/16" x 1/2" x 1 1/2"
Ⓑ "GUIDE" ——— " - 1/16" x 1/8" x 1 1/2"
Ⓒ "HOLDER"——— BALSA - 3/16" x 3/8" x 1"
Ⓓ "BLADE"——— A PIECE OF RAZOR BLADE
FIG. 4
JK

MODEL DESIGNING SIMPLIFIED

A Simple Method of Designing a Gas Model With Correct Proportions For Stability and Efficiency

By CHARLES HAMPSON GRANT

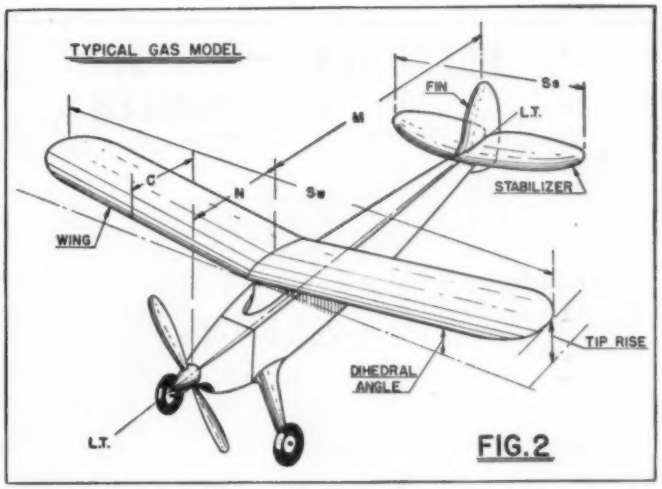


FIG. 2

Article 11

ANYONE who can design a good rubber powered model can design a good gas model, provided certain essential differences are known and taken into account. These differences are not apparent to a novice because they pertain to two non-visible ever-present factors—weight and speed.

Usually gas models are heavier and faster than those driven by rubber; consequently the ever present complicated force reactions on the plane in flight are intensified; usually to several times their values for rubber planes. Therefore forces that need not be considered in the latter type are exceedingly important to stability in gas models. They are generated by the model's weight or mass, the propeller thrust, lift on the wings, air resistance and the varying pressures on the plane's tail and structural surfaces.

These may be arranged to produce stable or unstable reactions. At slow speed they are slight and consequently in rubber powered planes improper arrangements often have little effect and are overlooked. But such an arrangement in a gas model, due to greater speed and weight, causes reactions so intense that stable flight is not possible.

Consequently the whole secret of good gas model design lies in properly locating the model's weights and surfaces. This is not difficult and can be accomplished by means of a few simple rules of proportion, that establish the correct arrangement of forces.

Many may be tempted to construct and fly their planes without first laying out the design carefully, which usually results in an unstable and poor performer. A little care and time given to proportioning the gas model will, in the end, result in better performance: fewer crashes and disappointments.

Purpose of the Model

The force arrangement depends to a certain extent upon the purpose for which the model is to be designed: as a high performance contest ship for duration, speed, a radio control plane or a scale gas job for sport flying. If a duration model, a steep climb and a long, flat glide is essential, requiring a high or a parasol wing of high climbing and soaring efficiency. If it is to be a speed plane, best results are obtained with the low wing type. A "radio" plane must be stable and controllable in level flight, requiring a high or parasol wing for best results. In a scale model, the force arrangement is more or less fixed but it can be modified by correct weight arrangement to give the best results possible with any particular design.

Here the purpose is to design a simple and very stable ship, that will fly well under all conditions of climb, level flight and glide. Therefore the most stable possible force arrangement is required.

Model Size

Size is the next consideration. Your first gas job should be comparatively small. Large planes are thrilling in flight but heart-rending when they crash; requiring considerable time and material to complete, large flying areas, and are difficult to transport. Very small planes as a rule lack flight capacity, are more erratic in flight and engine adjustment is more delicate and difficult: The latter being due to the required use of small light batteries of low current volume: because of this, batteries must be replaced more often.

Apparently therefore a plane of medium or comparatively small size is preferable—neither too small or too large. Small planes range from 30 in. to 40 in. span, large ones from 72 in. span upward. So a plane of medium size has a span of from 41 in. to 71 in. A span of 56 in. is average.

The choice of span size depends on an important factor—the size of motor to be used. Contest rules require that the plane weigh 80 oz. or more per cubic inch piston displacement of the engine, and that wing loading shall be at least 8 oz. per sq. ft. This places a low limit of weight and a high limit of wing area for any given engine.

Let us consider various size engines and the most efficient size plane to use with each. A popular class B engine is one with 2.9 cubic inches of piston displacement. Use of such an engine requires a total plane weight of 23.20 oz. For a loading of 8 oz. per sq. ft. of wing area or more, the wing has to has a total area of not more than 2.9 sq. ft. or 432 sq. in. Allowing 16 sq. in. for cut away rounded wing corners, the span times the chord, with a constant chord wing, would equal 448 sq. in. For efficiency the aspect ratio $\left(\frac{\text{Span}}{\text{Chord}}\right)$

(Continued on page 66)

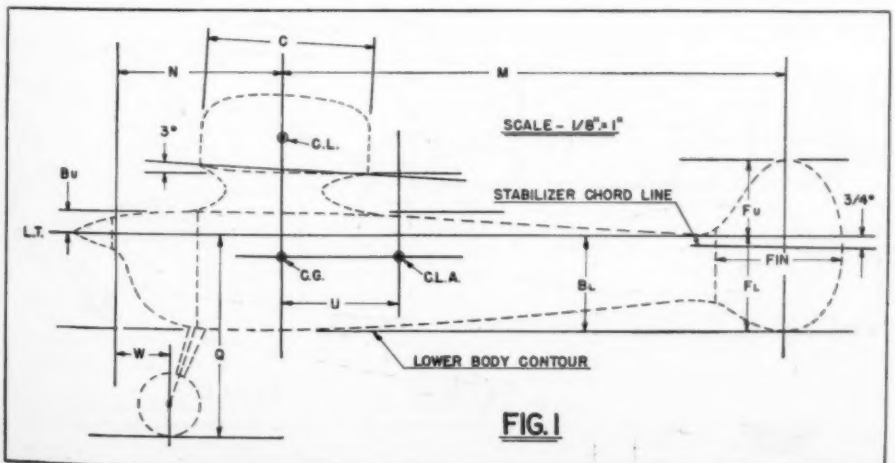
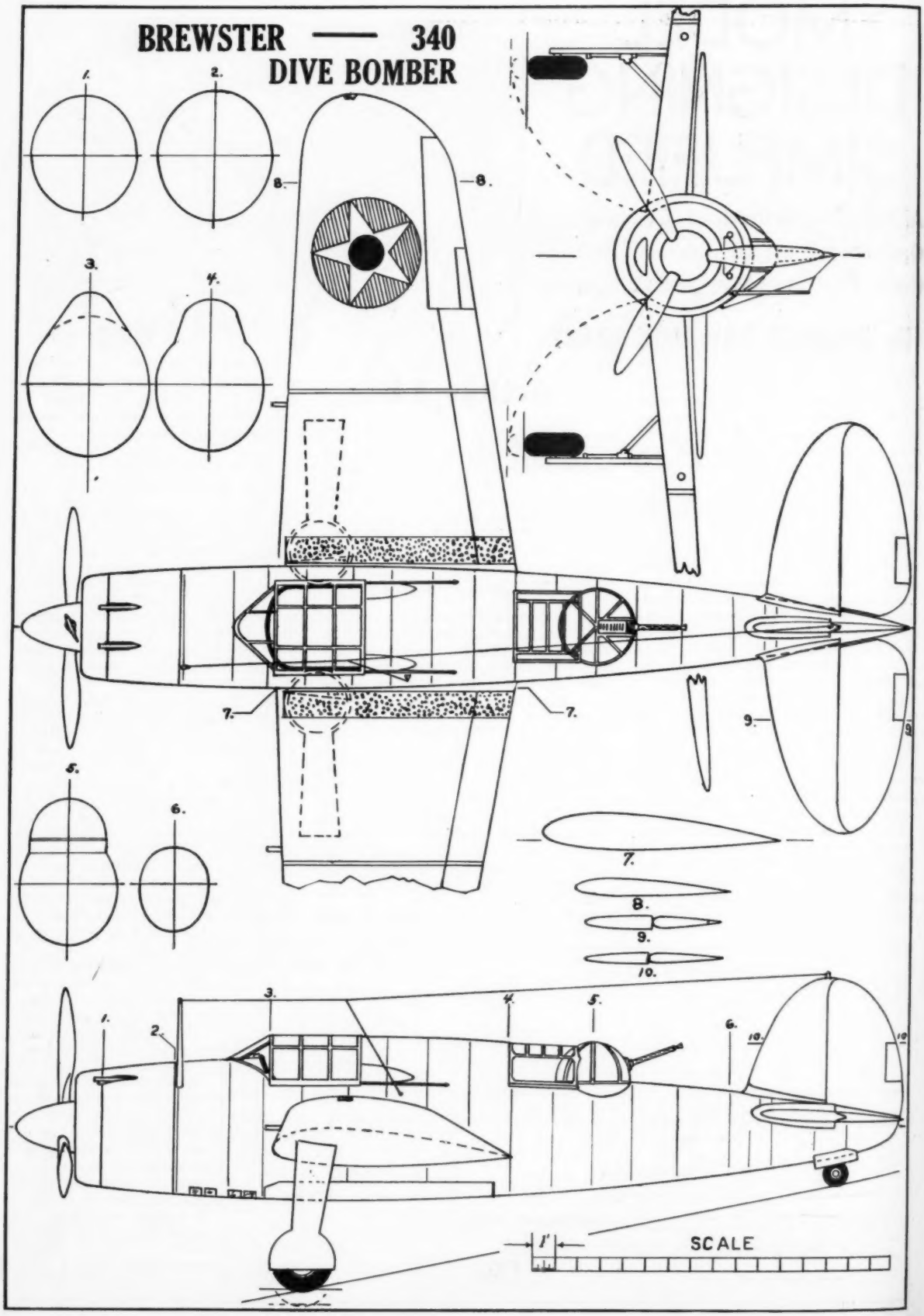
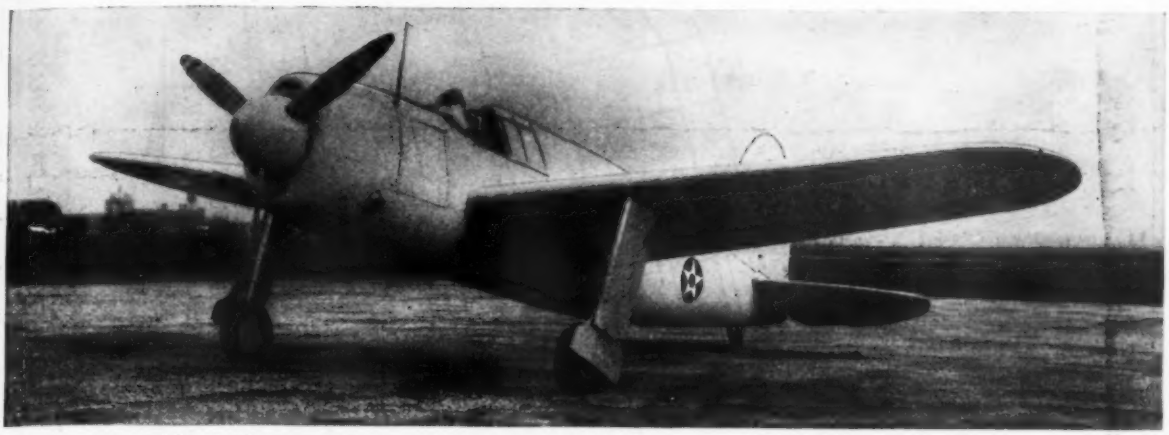


FIG. 1

Copyright 1941 by Charles Hampson Grant


BREWSTER — 340
DIVE BOMBER
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
SCALE
1'



The new long range Brewster dive bomber 340 which has just completed test flights successfully

Navy Tough Guy

The Plane on the Cover

By ROBERT McLARREN

THE dive bomber pilot: He's the Navy's tough guy. Typical is Lieutenant Robert S. "Bob" Taylor attached to VB-5 (Fifth Bombing Squadron) aboard the U.S.S. Lexington. He flies a Northrop BT-1 and for the time being is stationed at Naval Air Station North Island, San Diego, California. This is the Navy's No. 1 combat base and largest in terms of squadron activity. Here all carrier-based planes are stationed when units of the Pacific Fleet are in port. Here, too, can be found, in addition to shore-based squadrons and Marine Corps ships, units of the Scouting Force based aboard cruisers when the latter are in port. But port doesn't mean rest in the U.S. Navy!

And today, the green section of VB-5 is on the board for a practice bomb show on the Northern target range on Kearney Mesa. Lieut. Taylor has been assured that his dummy 50 pound bombs have been loaded, release mechanism and safety wires secured. Taylor emerges from the operations office with other members of his section, crams his order sheet in his jumper pocket, and awkwardly attaches his parachute leg harness as he moves towards the line. As he nears the ship his crew chief salutes him and announces: "Everything okay, sir. That vibration you heard was only a worn fairlead which let the locking wire on the left landing gear flap around in the rib cutout. I've replaced it, sir."

"Good!" Taylor snaps. "Then let's fire 'er up!"

The mechanic salutes and steps back away from the ship near the fire extinguisher dolly, alert for immedate action in case of a backfire. Taylor unlocks the hatch (it has been closed to prevent dust entering the cockpit), steps into the pit and lowers himself down in the seat with aid of the handgrip cutout in the coaming. He comfortably adjusts his parachute under him and shifts his life-jacket slightly. Then, rapidly but accurately, he checks the following items: 1. Landing Gear in Down Position—Locked, 2. Flaps in Up Position—Locked, 3. Fuel Guage indicating adequate fuel in all tanks, 4. Fuel Cock on Reserve, 5. Bomb control switch in Locked Position, 6. All Controls —Ailerons, Rudder, Elevators in good working order, 7. Propeller in High Pitch (Low r.p.m.) position, 8. Guns in Safety Locked Position, 9. Cowl Flaps in full Open Position, 10. Carburetor Air Scoop in full Open Position, 11. Oil Cooler Scoop in full closed position, 12. Supercharger switch in full OFF position.

Everything okay? Right! Then we're ready to start the engine. He makes certain that Aviation Machinist Mate L. R. Robbins is securely installed in the rear gunner's seat and yells: "Clear!"

The mechanic repeats "Clear!" and Tay-

(Continued on page 34)

The National Contest Was Great

Says THE INSTRUCTOR

THE 1941 National meet—the 14th annual affair recognized by N.A.A. and sanctioned by the A.M.A.—broke all records! It was the world's largest with 1286 contestants. It was the best run national competition, considering its size, and was something those who attended will never forget.

So vast was the entire enterprise it was impossible to be everywhere at once, so you could see only a small portion of what was going on at the headquarters hotel—the Sherman, at the outdoor field, at the indoor arena and at the Chicago Park District fieldhouses where results of each day's flying were computed into the "wee small hours."

After the usual registration process so confusing to newcomers, the big battle got underway with the indoor flying monopolized by the Boston delegation. Jim (Wakefield Team) Bohash of Detroit showed up with his famous model carrying box which has press clippings, baggage labels, mementos and souvenirs pasted to the inside cover making it a very interesting and informative display when the box is opened. Quality rather than quantity was the rule with indoor entries, although 35 models were counted at one time in the air at the International Amphitheatre.

There were few attempts at rule evasions either indoors or outdoors. The indoor meet was run off a wooden flooring laid over the dirt floor of the amphitheatre; a stand was erected for the officials' use. All blowers were turned off and conditions were fairly good for the modelers—many of whom have had little opportunity to fly indoor models in large arenas since the national emergency was proclaimed.

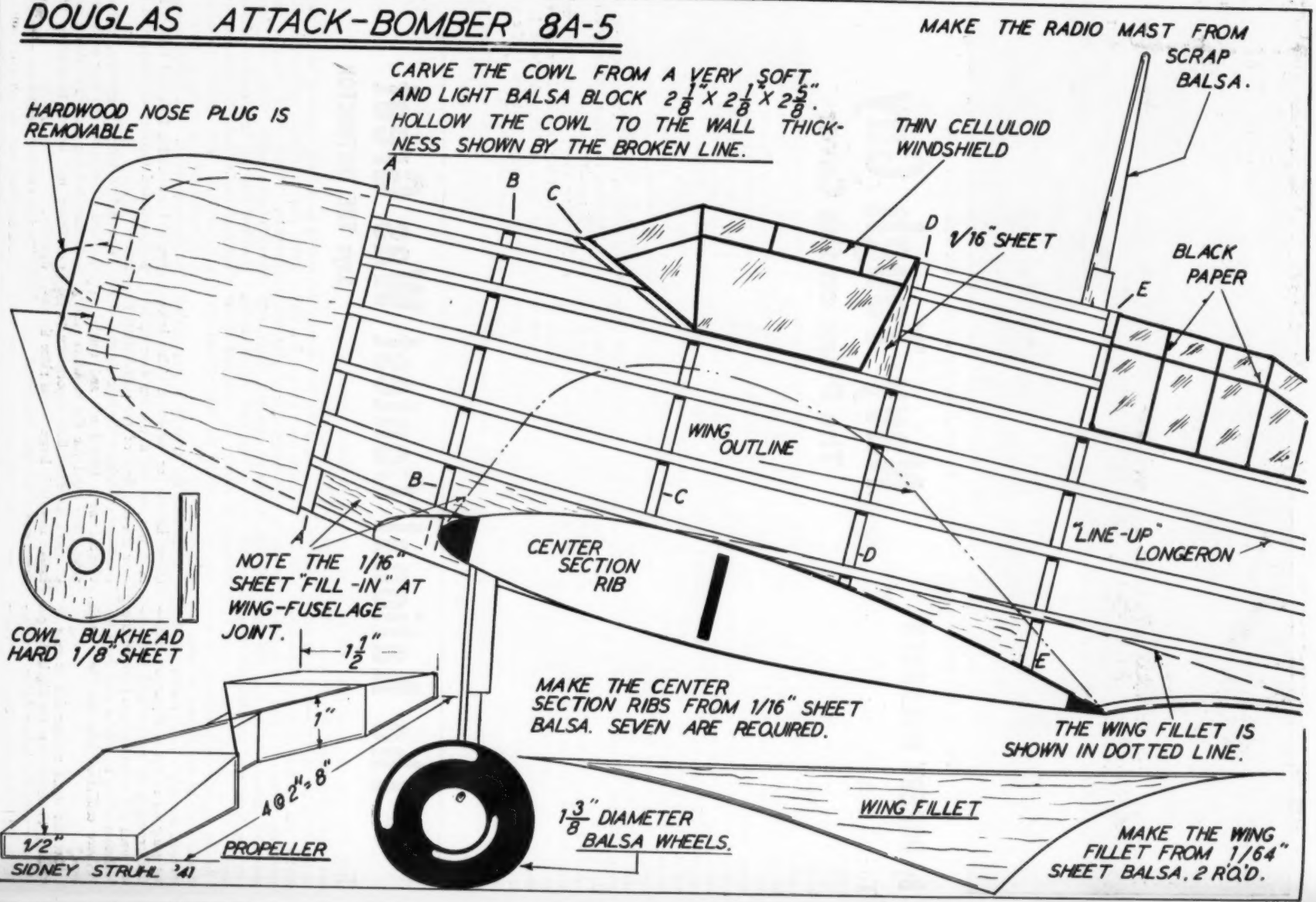
Raoul Hoffman, technical director of the meet in charge of processing, directed attention to the air movement in the arena, which played an important part in flight durations. Timers could relax in comfortable seats while timing the fragile craft and this was some comfort, although stretched necks probably produced some after-soreness. The retrieving balloons were varied colored, adding a festive note to the competition. The Cahill brothers, Jim of Connersville, Ind., and Bob of Detroit, returned together to competition flying.

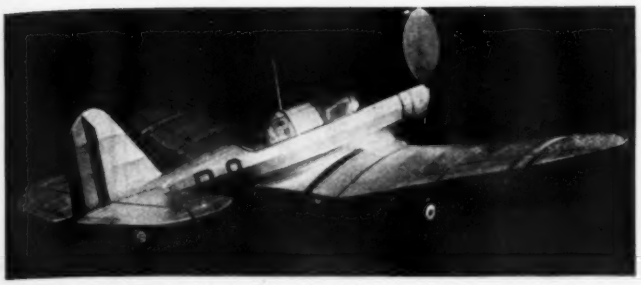
One indoor entry, a sparrow, was disqualified for stopping too long on a girder —10 seconds being the longest time a model can "hang up" before terminating flight duration.

Tendency toward smaller gas models was noted outdoors, with the greatest number in

(Continued on page 50)

DOUGLAS ATTACK-BOMBER 8A-5


MAKE THE RADIO MAST FROM SCRAP BALSA.
CARVE THE COWL FROM A VERY SOFT AND LIGHT BALSA BLOCK 2 1/8" X 2 1/8" X 2 5/8". HOLLOW THE COWL TO THE WALL THICKNESS SHOWN BY THE BROKEN LINE.
HARDWOOD NOSE PLUG IS REMOVABLE
THIN CELLULOID WINDSHIELD
1/16" SHEET
BLACK PAPER
A
B
C
D
E
WING OUTLINE
"LINE-UP" LONGERON
CENTER SECTION RIB
NOTE THE 1/16" SHEET "FILL-IN" AT WING-FUSELAGE JOINT.
COWL BULKHEAD HARD 1/8" SHEET
1 1/2"
1"
4@2"=8"
1/2"
PROPELLER
SIDNEY STRUHL '41
MAKE THE CENTER SECTION RIBS FROM 1/16" SHEET BALSA. SEVEN ARE REQUIRED.
1 3/8" DIAMETER BALSA WHEELS.
WING FILLET
THE WING FILLET IS SHOWN IN DOTTED LINE.
MAKE THE WING FILLET FROM 1/64" SHEET BALSA. 2 REQ'D.



A beautifully realistic scale plane that you will be proud of

An unusual flier with large propeller and stabilizer

A Flying Douglas Attack Bomber

By SIDNEY STRUHL

If You Want A Fine Flying Modern Low-Wing Warplane Model—Here It Is

OUR flying scale feature this month is the much talked about Douglas 8A-5 Attack Bomber. The reason for this talk, as you probably know, is not only the 8A-5's characteristics but the fact that they are still being produced in quantity for the DEFEATED Norwegian Government. You probably say to yourself, "If what that bird is feeding me is true, what is Germany doing about that?" Well, truthfully there is not much Germany can do, although she is trying; for, with the capitulation of Norway to the Nazis, what remained of the Norwegian Air Force took whatever equipment it could, fled to the sanctuary of England and from there they have operated as an independent unit of force to do what damage it could to the Nazi blitzkrieg machine. Thus Douglas is still making these attack bombers for the Norwegian Air Force.

The Douglas 8A-5 is also characterized by its high performance and all metal construction. It is a low-wing full cantilever single motor two-place attack bomber, powered by a Wright Cyclone air cooled motor of 1,000 rated horsepower. The top speed of the ship is 268 miles per hour which is pretty good if you consider its weight and type. The absolute ceiling is 29,680 feet; rate of climb, 1460 feet per minute and service range, 1450 miles. The Douglas is one of the most heavily armed attack bombers in the world; in the bottom of the fuselage are four rows of twelve bombs, of the twenty-five pound fragmention type.

As a model, the Douglas 8A-5 has been accurately reproduced and if plans are followed you will "wind up with" the most stable low-wing flying model you have built. After experiments on many low-wings the author has at last struck upon a formula that will produce the same type flying in a low-wing scale model as in the good old parasol standbys. Briefly some of these features include enormous tail surfaces (in relation to the wing area); the stabilizer is actually 35% of the wing area in the flying version of the 8A-5. A streamlined airfoil section is used to cut down the drag below the thrust line, thus aiding climb and reducing any diving tendencies. A wide-blade small-diameter propeller is used to cut down torque, yet not thrust. There are many other innovations which will show up when you launch your Douglas Attack Bomber on its maiden flight. So how about getting busy just to prove that we aren't kiddin' you?

Fuselage

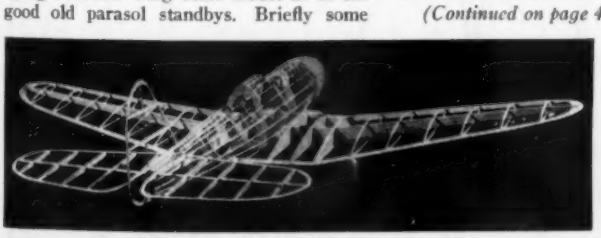
The first thing to do in the fuselage construction is match the magazine pages so that plans are lined up perfectly. Cut all the fuselage bulkheads from light grade 1/16" sheet balsa. You will notice only half the bulkheads are shown so it will be necessary to trace and then invert the tracings to obtain the other half. After the bulkheads are cut to shape they are glued in the proper position on the 1/16" x 1/8" hard balsa longeron designated by the term 'line-up' longeron. This longeron is used as a jig to start the fuselage assembly. After the cement has set add the 1/16"

(Continued on page 42)

In flight, very stable with steep climb

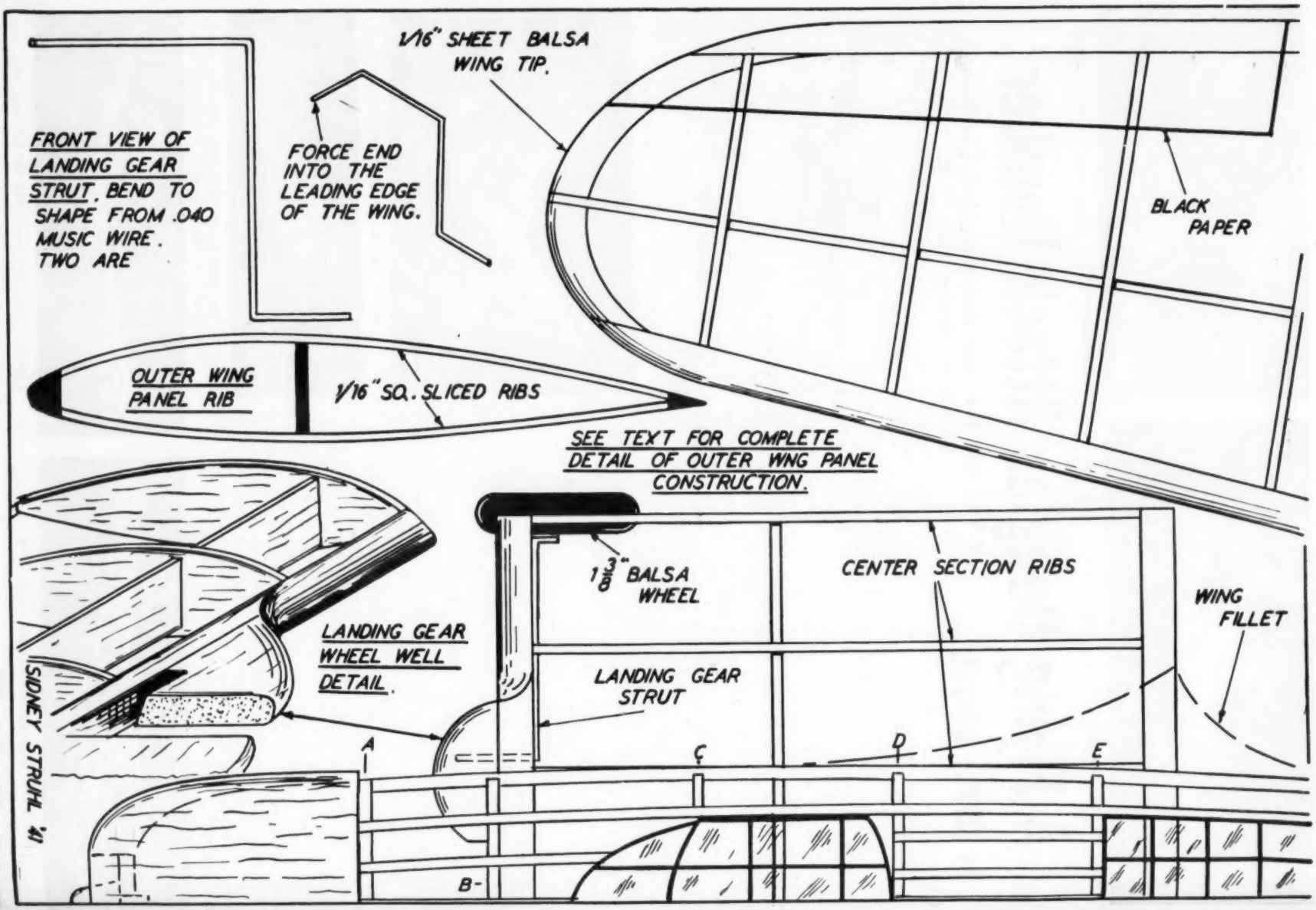
Very realistic when carefully decorated

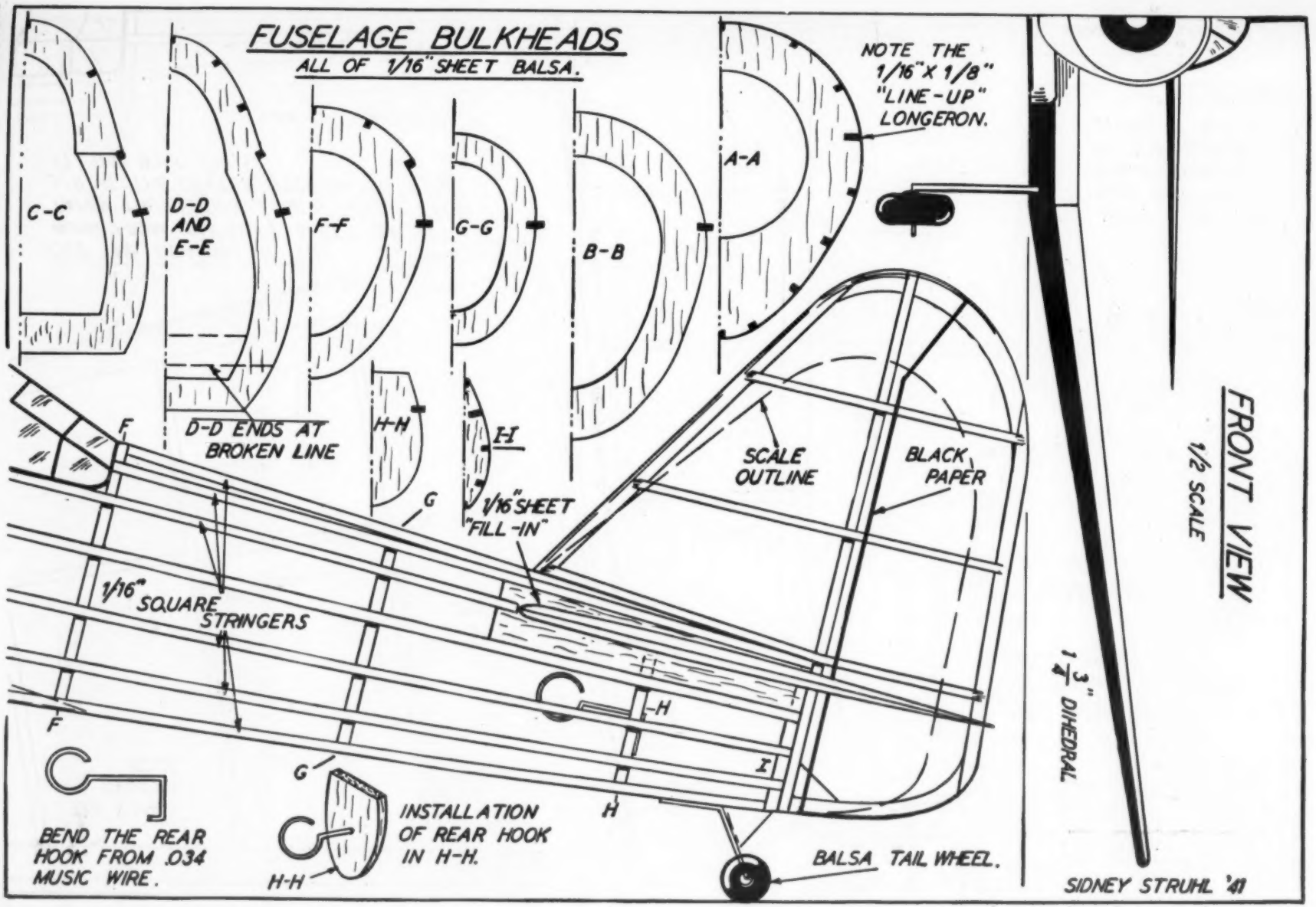
The wings are made as units and then assembled by slipping them over the main spars and cementing

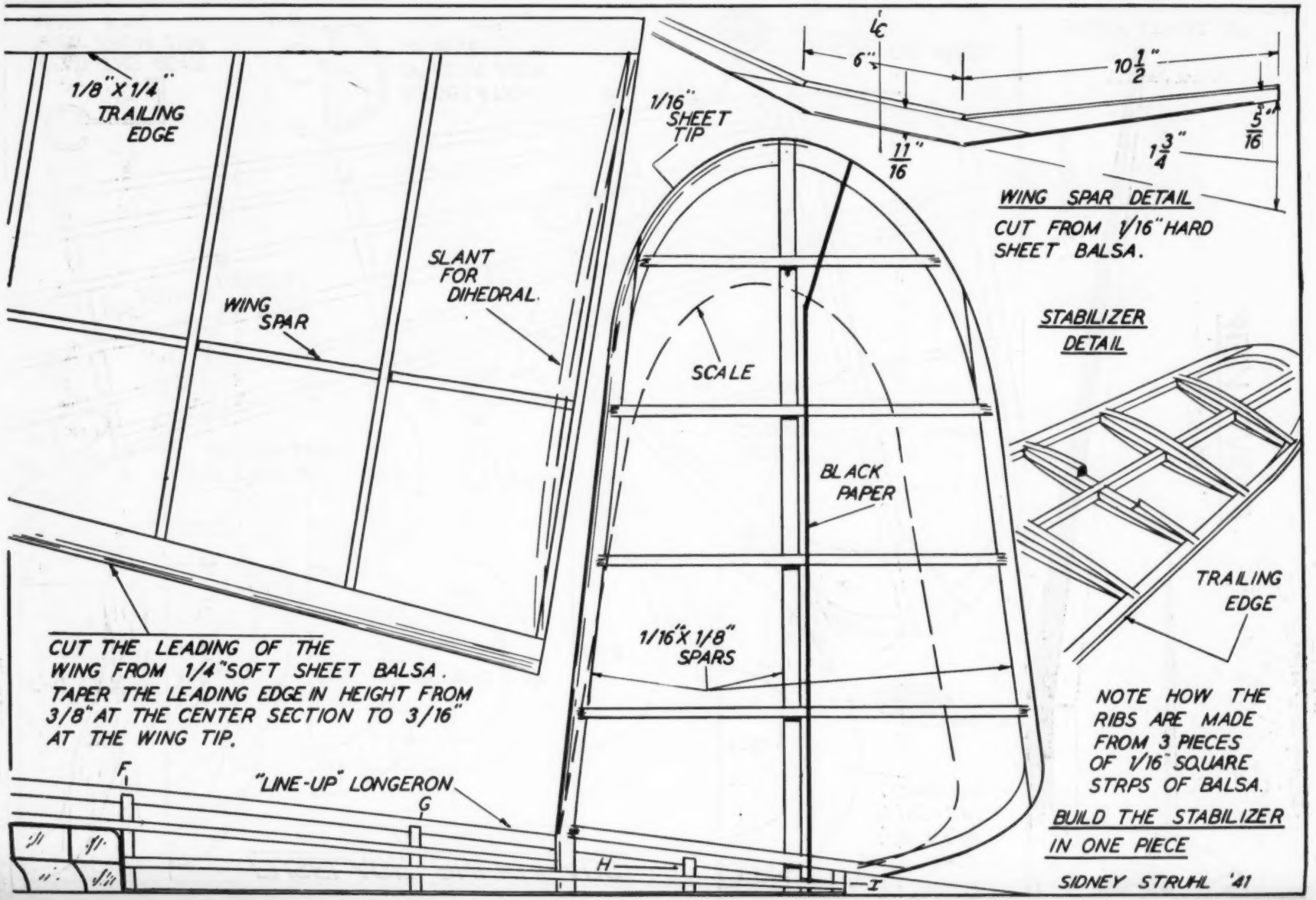


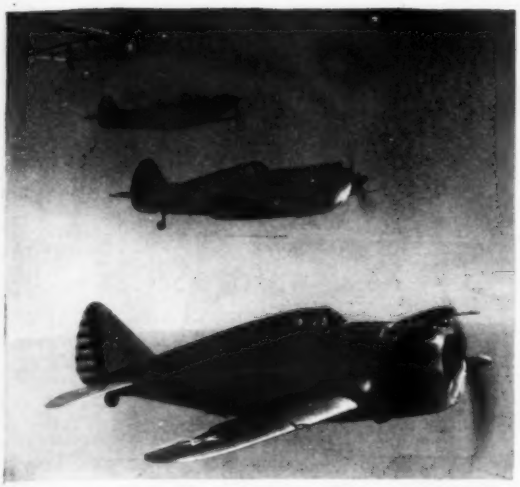
Note the large tail surfaces and "strip" ribs

Frame is very lightly built, like the full scale ship


FRONT VIEW OF LANDING GEAR STRUT. BEND TO SHAPE FROM .040 MUSIC WIRE. TWO ARE
FORCE END INTO THE LEADING EDGE OF THE WING.
1/16" SHEET BALSA WING TIP.
BLACK PAPER
OUTER WING PANEL RIB
1/16" SQ. SLICED RIBS
SEE TEXT FOR COMPLETE DETAIL OF OUTER WNG PANEL CONSTRUCTION.
1 3/8" BALSA WHEEL
CENTER SECTION RIBS
WING FILLET
LANDING GEAR WHEEL WELL DETAIL.
LANDING GEAR STRUT
SIDNEY STRUHL '41
A
B
C
D
E


FUSELAGE BULKHEADS
ALL OF 1/16" SHEET BALSA.
C-C
D-D AND E-E
F-F
G-G
B-B
A-A
NOTE THE 1/16" X 1/8" "LINE-UP" LONGERON.
D-D ENDS AT BROKEN LINE
H-H
I-I
1/16" SHEET "FILL-IN"
SCALE OUTLINE
BLACK PAPER
1/16" SQUARE STRINGERS
BEND THE REAR HOOK FROM .034 MUSIC WIRE.
INSTALLATION OF REAR HOOK IN H-H.
BALSA TAIL WHEEL.
FRONT VIEW
1/2 SCALE
1 3/4" DIHEDRAL
SIDNEY STRUHL '41


1/8" X 1/4" TRAILING EDGE
WING SPAR
SLANT FOR DIHEDRAL
1/16" SHEET TIP
SCALE
BLACK PAPER
1/16" X 1/8" SPARS
CUT THE LEADING OF THE WING FROM 1/4" SOFT SHEET BALSA. TAPER THE LEADING EDGE IN HEIGHT FROM 3/8" AT THE CENTER SECTION TO 3/16" AT THE WING TIP.
F
"LINE-UP" LONGERON
G
H
I
6"
10 1/2"
11/16"
1 3/4"
5/16"
WING SPAR DETAIL
CUT FROM 1/16" HARD SHEET BALSA.
STABILIZER DETAIL
TRAILING EDGE
NOTE HOW THE RIBS ARE MADE FROM 3 PIECES OF 1/16" SQUARE STRPS OF BALSA.
BUILD THE STABILIZER IN ONE PIECE
SIDNEY STRUHL '41



Here, shown for the first time in one photograph, are the four current pursuit fighters of the U.S. Army. T. to B. Lockheed P-38, Bell P-39, Curtiss P-40 and Republic P-43 (Arnold)

The newly developed Curtiss P-40D pursuit, shown for the first time

FRONTIERS

Highlights of the Latest Developments in Aviation

The North American B-25 medium bomber, now being produced in quantity for the Army (Arnold)

By ROBERT C. MORRISON

ONE great trait of human nature is that it is difficult, extremely difficult, to change the habits of a person, to make that person formulate a new aspect on a situation. People of the "old school" are determined to the end their way is right, and it is nearly always a case of learning the hard way. With a person accustomed to doing something continually the same way, it is usually a trying ordeal to divert his methods to a newly created course. Yet everyone knows that everything created is subject to improvement and is outmoded by the passing of time. There is just cause for the innocent and natural adversity toward this "changed order" in that the old methods were tried and proved. However, circumstances surrounding this topic in question have changed, and their direct and indirect bearing on the matter, especially in this present "streamlined" world, necessitate immediate and drastic action.

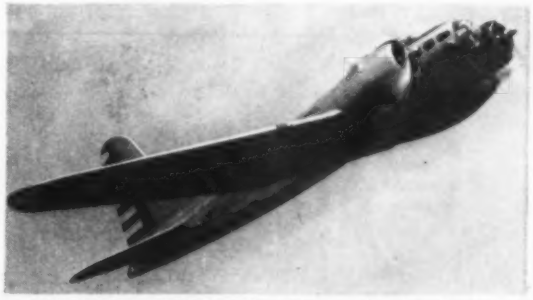
Such is the case in the aviation industry today.

The war has brought about a very sudden change in the aviation industry trend, and aviation personnel are gradually adapting themselves to the new way of things. It is a psychological change, but it is doubtful if the change is taking place rapidly enough. There are two factors involved; design of higher performance aircraft and production of larger quantities of aircraft. The former has its effect on the pilot; the latter, on the designer. The planes now rolling off production lines are really high-speed military creations that give the pilot reason to exclaim "Jeepers Creepers" after flying one. Pilots who have years of experience have looked upon these new ships much in the same manner as they have those of the past: Before them is a new airplane; they have flown many types and this is just another new one. Some have become thoroughly familiar with the plane, while others have not. They use their usual technique from past flying experience, and, in many cases, much to their surprise, they have a very high tempered ship in their hands.

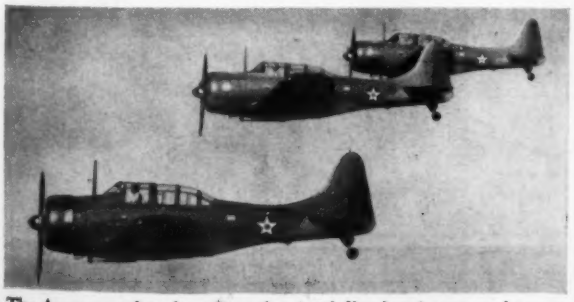
When it comes to landing, especially, some of their ideas on flying change instantly because there is much difference in landing at 100 m.p.h. than at 60 m.p.h. as in the past. In case of hydraulic brake or flap failure it is to the pilot's benefit that he makes his landing in the Land of Great Expanse.

We do not mean aircraft have become more dangerous to fly, but they have attained a much higher performance and require new methods of handling in order to be as safe to fly as formerly. Requirements

(Continued on page 54)

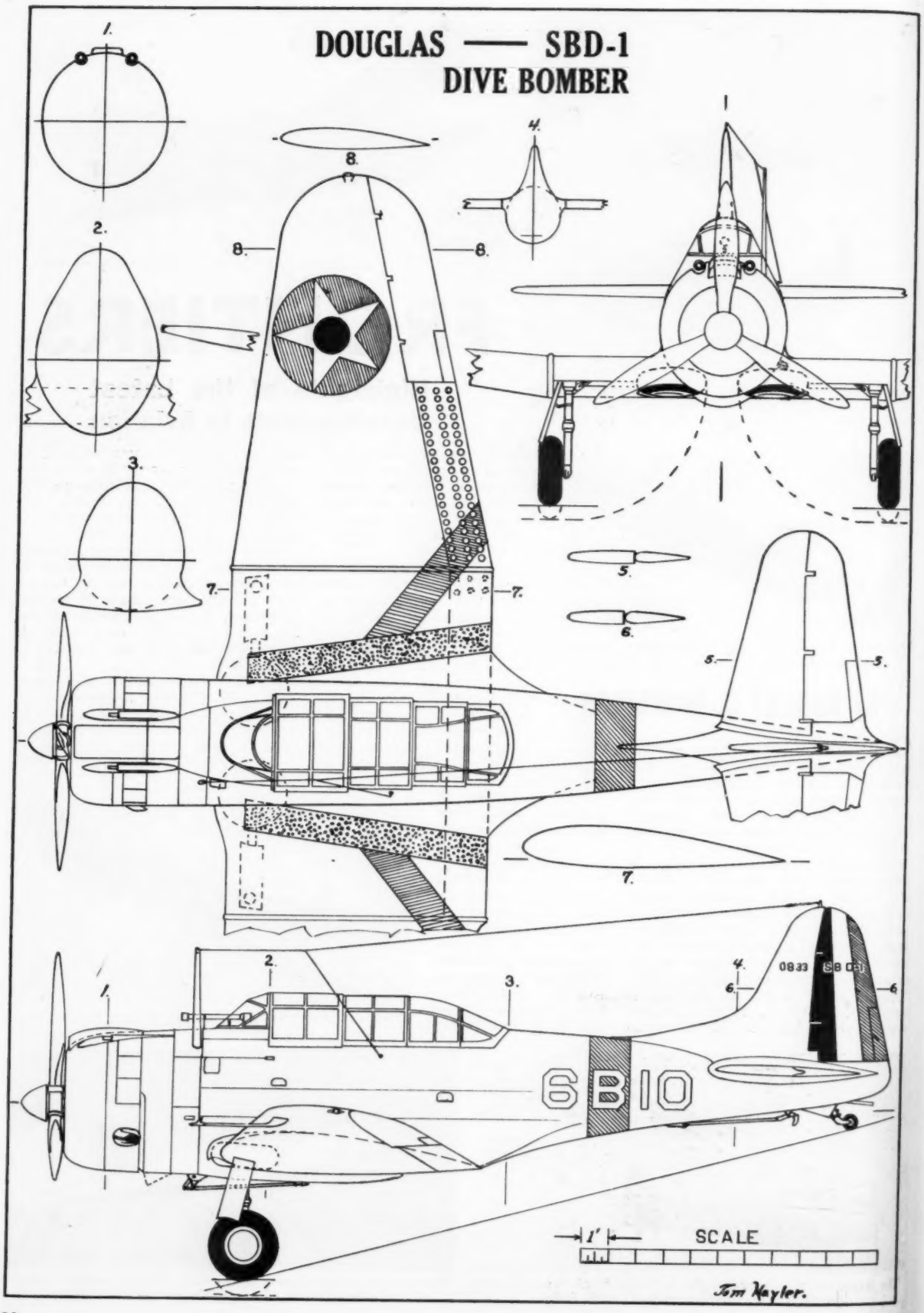


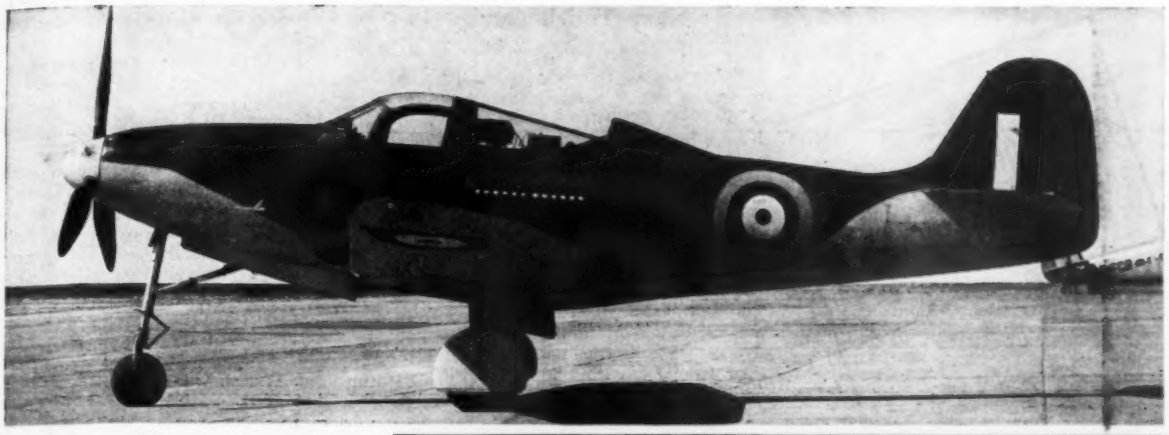
This is the new sleek Douglas B-23 medium bomber, powered with two 1600 h.p. engines



The Army says that these Douglas A-24 dive bombers now in mass production are better than the German Stukas

The new two place Curtiss SNC-1 high altitude combat trainer now being produced in quantity for the U.S. Navy


DOUGLAS —— SBD-1
DIVE BOMBER
1.
2.
3.
4.
5.
6.
7.
8.
6B10
SCALE
1'
Tom Hayler.



The American Bell Airacobra P-39, all dressed up in its British "overcoat" with insignia. They are being produced in quantity for both the U.S. and Britain

FLASH-NEWS

Special To Model Airplane News

BIGGEST news of the month was "Flash News'" recent breakfast in Los Angeles with Bill Knudsen, Director of the Office of Production Management. There, too, was Major General George H. Brett, Chief of the Air Corps. From our triangular discussion, each of us representing design, production and military tactical use, came the following conclusions: We are now producing more military airplanes than the Germans and will continue to increase production until next Spring when our figures will be approximately double those of Germany. Our planes are by a long shot better; we have the fastest pursuit, the best dive-bomber, the most deadly attack-bomber and by far the best heavy bombers in the world. The production of machine tools, vital to airplane production, is as great as Britain and Germany combined; the production of raw materials greater and the high degree of workmanship surpasses both these warring nations by one hundred percent!

"Freezing" of designs has in no way affected new designs, only changes on old ones, and more than one dozen new military airplanes will be completed before the end of this year. Three of them will be distinct surprises to even the best informed but unfortunately we cannot even whisper a hint as to their identity or design. Brett has, however, promised a "go-ahead" signal on the information when the time is right and "Flash News" will give all permissable details at that

(Continued on page 60)

AIR YOUTH OF AMERICA

News of Importance to Modelers

OCTOBER'S the time for new club programs. With the outdoor flying season pretty well out of the way, and schools starting up, this month clubs will be swinging their attention from flying activities to building planes and other projects.

What's your group going to do? Most clubs expect this to be the biggest winter season so far, and are laying plans for a schedule of events that will keep members active right straight through the calendar. With the emphasis on aviation in the national defense program, they have found new interest with new members the result of well planned programs.

If advance signs mean anything there will be a record breaking number of new entries, too. Out in Kansas, just for example, Leo Rutledge, has plans to organize one hundred active new junior aviation clubs by early fall. In Texas, where the Air Youth program has gotten under way under the sponsorship of the Cullen Fund, there'll be an even more ambitious campaign for getting schools and youth groups busy in the field of junior aviation.

Winners of Air Youth Medals for rubber power flying at the 9th Annual Michigan State Model Plane Meet. L. to R.: 1st place, William Allsopp; 2nd, Jacob Drake; 3rd, Phillip Klintworth

Aircraft Spotting

This winter a number of clubs will be working with the Interceptor Commands of the U. S. Air Forces. This is the organization created to take charge of needed observation work, in the event of an emergency due to possible invasion of

(Continued on page 58)

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Navy Tough Guy

(Continued from page 25)

lor ducks down in the cockpit. He turns on the ignition switch, presses the starter pedal to position marked "ENERGIZE" and plunges the primer pump two or three times throwing a spray of raw gasoline into the top three cylinders. He advances his throttle about a half-inch forward and listens to the whine of the starter as it gains speed. When the scream reaches a long accustomed pitch, his heel grinds against the starter pedal marked "Engage" and the big twin row engine coughs, spits, catches, wheezes, then roars into power. Slowly he advances the throttle and eases the propeller from High Pitch into Low Pitch as the engine gains revs. Then he relaxes as the warm-up period gets under way—five minutes at least, more if convenient. Now the engine guages are beginning to bob around, the tachometer (engine speed) dances around 1500, the oil and cylinder head temperatures begin to rise, the oil and fuel pressures climb up the dial, the hydraulic and vacuum pumps begin to surge power through their lines and the gyro instruments begin to whirr. As these guages reach their normal positions (Cylinder head temperature: 150, oil pressure: 90, fuel pressure: 15) it's time to test the magnetos. First the left is switched off and the engine operates only on the right, then vice-versa. The drop in r.p.m. is far less than the 100 danger mark, so we're all set.

A glance at the control tower shows the wind tee pointing to the two-ball runway (the head of each runway has a large white circle or circles cemented into the ground to indicate No. 1, 2, 3, etc.) so Taylor glances up and down the line at his section mates and gets a nod of preparedness. Then he signals to the mechanic who drags the chocks away, he releases his brakes, guns his engine, presses his right brake pedal and skews around into the direction of the runway. With a careful eye out for approaching ships he wobbles along the runway sticking close to the right side to give plenty of landing room to any ships in the air.

At the head of the runway, Taylor pauses, gives a careful look around the skies for approaching planes, tests his magnetos once more, revs his engine up to full operating speed, checks his engine instruments for the desired take-off readings, secures his chin strap, checks his safety belt and radios to the control tower that everything is okay for the take-off. Two other ships have pulled up alongside him and when the green signal from the tower flashes, the three ships roar with power, their tails come up in unison and they scream down the runway. In an instant they are off in a long, climbing turn into the North while the next three ships are forming behind them.

Taylor checks his instruments once more, sets his throttle for cruising, his propeller for most economic r.p.m., checks to see that his landing gear and flaps are up and locked and circles for the rest of the green section to catch up. Formed, the ships head for Kearney Mesa and the bombing range.

Over the range now, contact made with the ground crew, everything is clear, Taylor is well above 15,000 feet and Green Section is ready for its work. Taylor is first. Over on his back, then down on his nose and the straight, screeching, gut-busting power dive: SEVENTY DEGREES towards the ground at five hundred miles per hour!

The altimeter seems to race around the dial and the target to leap up in his sight at him. Remember, it takes 2500 feet to pull this baby out, 5000 to be safe so watch that altimeter. Six thousand and Taylor's fingers tighten on the stick, 5500 and he braces himself, 5200 and his left hand pulls the bomb release lever, once, twice, three times. Quick now, into the safety catch with the toggle. Five thousand and Taylor's powerful wrist hauls back on the stick. His insides are thrust down until they seem ready to leave him. The blood rushes from his head. He can hear nothing, feel nothing but that great, searing pain in his lower abdomen.

But still his aching right arm clings to that stick, fights the bucking, yanking pressure back towards his safety belt. Slowly his eyes begin to dim. He begins to feel faint. Too much! Dangerous! He eases the stick forward a bare inch and feels his vision clear again, that pressure on his eardrums relax. Vaguely he sees his altimeter read 3,000 then 2,750, then 2,500. There's no plane, no target, no world, no Taylor, only that excruciating torture in his intestines. He writes in agony until at last his altimeter bounces off of 2,250 and whirrs back up the dial, 3000, 4000, 5000, up, up, up. When it slides past 9,500 feet, Taylor eases the stick forward and feels breath in his lungs again. He makes out the hundred foot marks on his altimeter, the 10 r.p.m. marks on his tach. Then he glances out and sees the clouds parallel to him: horizontal again! That great, rushing speed is past and he is floating along again. That knife in his stomach has ceased turning and is slowly being withdrawn. It's over. Thank God, it's all over!

For a few moments he relaxes, feels the perspiration on his hands cool, the sound of the engine becomes real again. Then he cautiously peers over the side at the ground crew signal hut. Three direct hits! A slow smile creeps across Lieutenant Robert S. "Bob" Taylor's face. Then it melts into slanted eyes, firm jaw and clenched teeth as he grabs altitude and heads for 15,000 feet: to do it all over again, and again after that, and again and again! Sure it's hell. It's torture every time, but so what: he's a Navy dive bomber pilot, the Navy's Tough Guy!

Yes, Taylor took a physical beating and takes it every day but what about his ship? If that rugged Northrop BT-1 could yell what kind of a noise would IT make when its 6500 pounds are tearing its insides out, when its wings with their load of 20 pounds per square foot is multiplied by nine and are struggling like demons to tear themselves loose, and when its big double row engine is yanking itself out of its mount? Yes sir, the dive bomber is also the Navy's Tough Guy, tough because it has to be, tough because it takes the worst beating of any airplane in the world!

And ships don't last long under that punishment either. That's why the rugged Northrop BT-1 is moving out to make room for an even bigger and tougher dive bomber, The Brewster SB2A-1 Dive-Bomber, the latest Tough Guy in the Navy!

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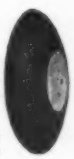

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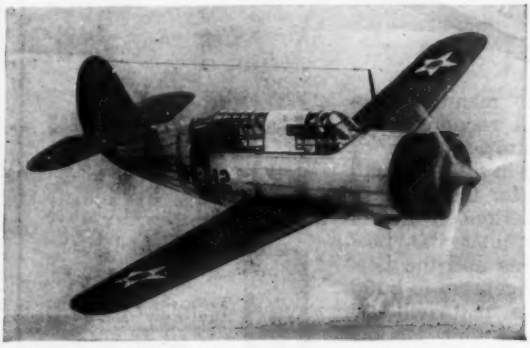

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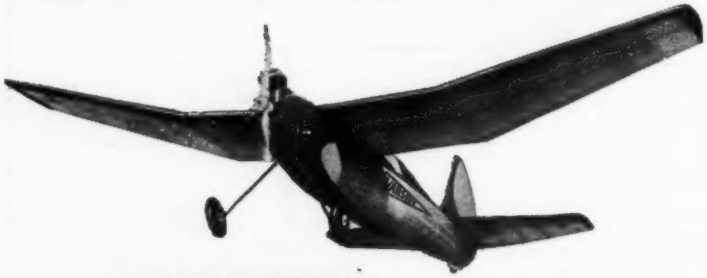

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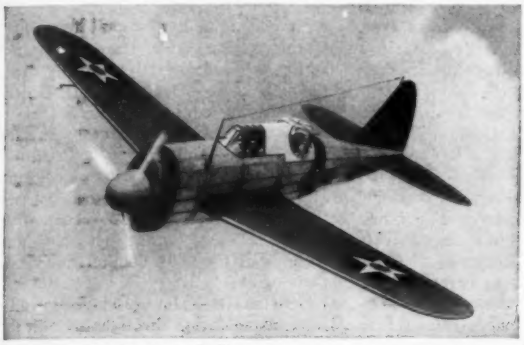
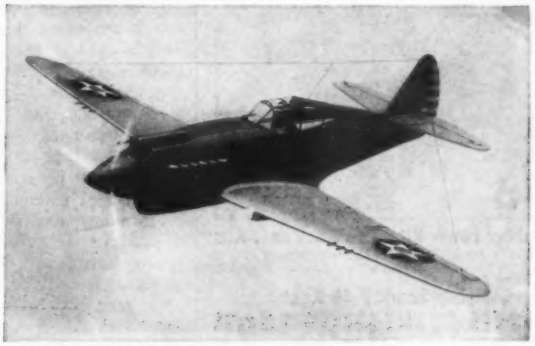
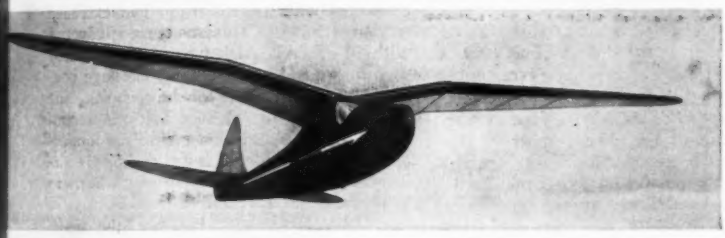


BREWSTER 340 . . . U.S. Navy Dive Bomber



CURTISS Hawk P-42 . . . U.S. Army Pursuit Plane



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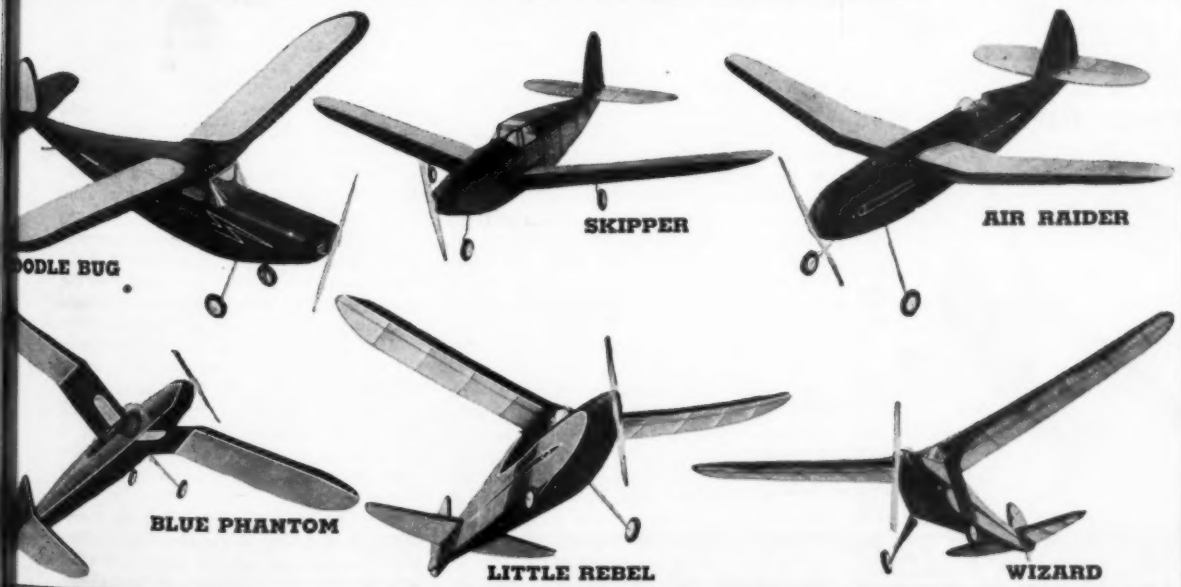

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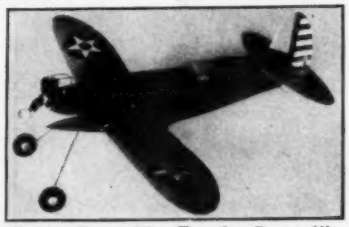

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In the May, 1941 issue of MODEL AIRPLANE NEWS we gave you a brief history of the Brewster Aeronautical Corporation, the following from which is an excerpt: "With this experience and contacts thus made, Brewster decided to launch into the aircraft construction field. Thus in 1934 work was begun on an entirely new type fighting craft and early the following year the Brewster XSBA-1 two seat high-speed scout bomber was introduced."

This new step forward for Naval Aviation laid the foundation, seven years ago, for our Plane on the Cover this month. It was a mid-wing design, first of its type, with a landing gear which retracted in a peculiar way; folding into both the fuselage and wing. The ship was clean in appearance and its design was a very business-like job. It was powered with a 750 horsepower Wright Cyclone engine, had a top speed of 302 miles per hour at 17,000 feet with a full load of 5381 pounds. This was exceptional performance and its maneuverability and down-right fighting strength placed it in strong favor with the Bureau of Aeronautics. But 1935 was, unfortunately, a poor year for Naval Aviation appropriations and the Navy decided, rather than spend money for the plane's private construction, to undertake the construction of a small number itself. Therefore, the entire rights and designs of the SBA-2, as it was later known, were purchased and the Naval Aircraft Factory in Philadelphia built a small number of the modified version for service test.

With news of the blitzkrieg type of warfare and use of the dive bomber by the German Luftwaffe in mass flights (particularly the all too wel-known "Stuka") the need for an American "Stuka" became apparent and Brewster engineers set about bringing their original version up to date.

As the labor of re-design progressed on the SBA-1, the original version seemed to slowly disappear and the new XSB2A-1 bore only a basic resemblance to its forebearer. Every change was an improvement and this newer and bigger dive bomber is the Navy's Number One threat against a sea aggression.

WINGS—The wing is the full cantilever box spar type, mid-wing design, situated half-way between the belly and fuselage top. This box spar type construction, while of the single-spar variety, actually gives the strength of the conventional two-spar wing while resisting torsion due to its box-type beam. The ribs are stamped aluminum alloy with pressed flanges about the mold line and lightening holes to save weight. They are in three sections, riveted to the spar stiffener angles. Extruded stringers are laid laterally the span of the wing and riveted to the spars with aid of small right-angle clips. This structure is covered with 24STAL aluminum alloy sheet coated with pure aluminum for maximum resistance to corrosion. The area aft of the spar rear member is fabric covered as it is a low-load carrying area and this method affords a greater weight economy. The wing tips are removable for ease of disassembly and inspection for lighting equipment.

CONTROL SURFACES—The ailerons are all-metal frame, fabric covered. They are cable controlled, equipped with trimming tabs on their inner trailing edges and are controllable while in flight from the cockpit. The flaps are the split trailing edge type, hydraulically controlled. They move through a total angle of 60 degrees and are covered with heavy-guage sheet to provide adequate strength in diving. The wings' undersurface also have a new type dive-brake which projects out into the air-stream to safely control the rate of descent. Details of these items of equipment cannot be released due to service restrictions. The rudder and elevators are of all-metal construction, fabric covered.

Each of the three surfaces are equipped with controllable all-metal trimming tabs on their trailing edge. They are dynamically, statically and aerodynamically balanced through use of lead weights bolted into their leading edges. The vertical and horizontal stabilizers are of fixed, full cantilever design being built up on a structure of a single spar along their hinging edge, a small intercostal member, pressed flange ribs, extruded stringers and a covering of Alclad sheet. Riveting on the wing and tail surfaces is of the 100° countersunk flush type throughout.

FUSELAGE—The fuselage is all-metal monocoque design throughout, built in three sections: the power plant, hull, and tail sections. Structure consists of a series of vertically arranged open section bulkheads connected with longitudinally laid extruded section stringers. This structure is covered with 24—STAL Alclad sheet flush riveted throughout. The entire upper fuselage portion is open to provide for the cockpits. The structure between the cockpits is monocoque, bolted to the upper fuselage longerons. Just below the front cockpit is the large cutout for the landing gear wheels to fold in upon retraction.

LANDING GEAR—Possibly the most unique feature of the SB2A-1 is the novel landing gear design which utilizes both wing and fuselage to stow the gear in the full retracted position. Upon leaving the ground, the oleo stroke-travel lowers the wheels eleven inches permitting the outside cover plate to swing down to its hinge axis. Upon retraction the main strut folds into the wing leading edge and the wheels into the fuselage. The fuselage opening is then covered by the wheel plates folding at right angles to the wheel and the entire wing and fuselage surfaces at this point are completely smooth, offering unhampered airflow. The main landing gear is single pneudraulic cantilever strut design.

The retracting strut (hydraulic) extends from within the wing to a point 1/3 the entire strut length. It lies parallel to the spar and during retracting action pulls into the piston causing the support strut to move inboard at its upper end. This in turn causes the landing gear strut to pivot at its upper end and thus swing the wheel into its well. Smooth contour 6-ply tires are provided. The tail wheel is also fully retractable, of the familiar standard Navy solid-tire design; it swings rearward and up into the recess provided.

PROPELLER—The propeller is three-blade all-metal. It is the new Curtiss electrically controlled constant speed design and incorporates blade sleeves or "cuffs" described in detail in MODEL AIRPLANE NEWS, March, 1941. The entire propeller hub is enclosed in a gigantic nose spinner which

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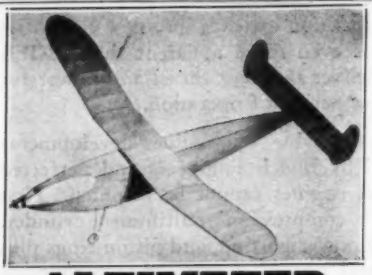

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Kit contains 28 machine cut wing ribs, notched and undercambered; 11 stab. ribs; finished trailing edges; formed landing gear; streamlined wheel; drilled and finished nose-plug; B. B. washer; dowel and plates; sheet balsa rudders; tissue; cement; balsa; etc.....**$1.00**

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serves the purpose of controlling the engine cooling airflow, protects the pitch-changing mechanism and adds streamlining to the ship.

COWL—The engine cowl is the form-fit type in that only a 2-3/4 inch annular ring of exposed space is left for the engine cooling air, thus providing a forced flow of air in both intensity and direction. Two small louvres are provided in the nose, the upper for carburetor air intake, lower for oil cooler air intake. Due to this controlled feed of engine cooling air, cowl flaps are not required.

ENGINE—The engine is the new Wright double-row 14 cylinder air-cooled radial model GR-2600A-5B with maximum power rating of 1700 horsepower at 2100 r.p.m. at 5400 feet and for takeoff at sea-level. It has a blower ratio of 7.4-1 weighs 1875 pounds and utilizes 95 Octane fuel. This blower is of the two-speed type, the high blower having a ratio of 8.6-1.

LUBRICATION SYSTEM—Engine lubrication is provided by an engine-driven oil pump and scavenger pump, oil reservoir, drain cock, oil temperature regulator with radiator, oil dilution system and vacuum system separator. The oil tank is mounted in the upper rear portion of the powerplant compartment (forward of the firewall) and has a capacity of 12 gallons with foaming space. From here it is taken through the oil strainer and directly into the engine. The scavenger pump forces the hot, used oil out of the engine and into the pressure and temperature regulator, thence into the cooler. This radiator is the core type, located in the powerplant compartment bottom just under the engine. From here it is routed back up into the oil tank.

FUEL SYSTEM—Fuel for the engine is carried in integral fuel tanks located within the wing center section and has a total capacity of 156 gallons carried in two inboard tanks.

ENGINE CONTROL SYSTEM—The engine controls are located on the left side of the cockpit, consisting of throttle, mixture regulator and propeller pitch changing control handle. In addition there are ignition switch, starter control pedal, generator control, oil cooler and carburetor air intake control and carburetor air heater control. All are of the push-pull rod type with bellcrank joints and rod end bearings.

EXHAUST SYSTEM—Each bank of seven cylinders has its own exhaust system consisting of an Inconel welded manifold terminating on the outside of the fuselage in an open face outlet.

VACUUM SYSTEM—The vacuum system consists of an engine-driven vacuum pump, pressure relief valve, oil separator and gyro instruments.

HYDRAULIC SYSTEM—The landing gear (main and tail wheel) flaps and dive-brakes are hydraulically operated as is the power-driven turret over the rear cockpit, details of which cannot be released due to military restrictions. The system consists of hydraulic fluid reservoir, pressure relief valves, buffer valves, pressure regulator valves, hydraulic actuating cylinders and the pilot's control valves.

ARMAMENT—(Fixed) Fixed armament is two fifty caliber machine-guns mounted one in each outer wing panel just outboard of the landing gear hinge fitting.

(Flexible) Flexible armament consists of the power driven turret housing a single 37 millimeter cannon. It is hydraulically operated and controlled by the rear gunner by foot pedals. The gun moves in a vertical arc through a slot in the spherical moulded plastic transparent housing.

(Bomb Load) Bomb loading consists of a various assortment of possible combination bomb loads varying from a single 2,000 pound aerial torpedo to forty 50 pound fragmentation bombs. Main use of the SB2A-1 will, of course, be that of a dive bomber with usual load being four 500 pound demolition bombs mounted within the bomb hold located just under the wing and concealed by two large hydraulicaly operated bomb doors which fold down and out for action. When the larger bomb is installed, a special bomb swivel unit is mounted within the compartment which throws the bomb out clear of the plane after which it is retracted back into the bay and the doors closed.

INSTRUMENTS—(Flight) Instruments carried aboard the SB2A-1 include: Air Speed Indicator, Altimeter, Automatic Pilot, Compass, Clock, Bank and Turn Indicator, Aperiodic Compass, Flight Indicator (Gyro Horizon), Turn Indicator (Gyro Direct) and Rate of Climb Indicator. (Engine) Instruments include: Tachometer, Thermometer, Fuel Pressure Guage, Oil Pressure Guage, Engine Guage Unit, Thermocouple (Engine Cylinder Head Temperature Indicator), Manifold Pressure Guage, Fuel Mixture Indicator, Exhaust Gas Analyzer and Fuel Pressure Warning Signal.

(Navigation) Instruments are: Navigation Compass, Chart Board and Map Storage, Drift Meter, Drift Signal and Rack Release, Pelorus, Automatic Pilot and Gyro Control. (Miscellaneous Instruments and Controls and Items of Equipment) include Suction Guage, Fuel Level Guage, Free Air Thermometer, Pressure Guage, Indicating Accelerometer, Generator, Battery Starter, Landing Gear Signal, Flap Signal, Dive Brake Signal, Flare holder, Oxygen Equipment, Parachutes (2), Safety Belts (2), Life Raft, Flotation Equipment (Emergency), Fire Extinguisher, Heating and Ventilating System.

RADIO—Radio equipment includes the following: Transmitter, radio compass, Interphone, Marker Beacon Receptor, Antenna Equipment, Receiver and Dynomotor.

SPECIFICATIONS: The SB2A-1 has a wing span of 45 ft., 7 inches and is 31 ft. 4 inches long. It stands 11 ft. 3 inches high. Wing area is 292 square feet. Flap area: 22.4 square feet. Fin area: 10.4 square feet. Stabilizer area: 33.9 square feet. Rudder area: 12.5 square feet. Elevator area: 31.2 square feet. Wing Loading: 20.95 pounds per square foot. Power Loading: 5.48 pounds per brake horsepower. Empty weight: 4142 pounds. Useful load: 1970 pounds. Gross weight: 6112 pounds.

PERFORMANCE: Top speed of the Brewster SB2A-1 is over 325 miles per hour with a full military load at 17,000 feet.

This, then, is a complete picture of this newest and most terrible of our Navy's aerial war weapons. But to give it, you've got to be able to take it and that's just the department in which the SB2A-1 operates because, after all, it IS the Navy's Tough Guy!

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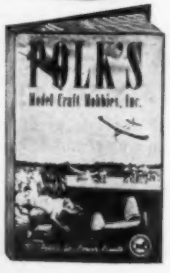

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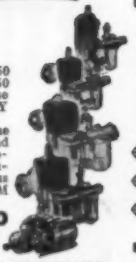

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A Flying Douglas Attack Bomber

(Continued from page 27)

square stringers as shown in the side view. Notice that some bulkheads have notches to accommodate some stringers, while the majority of them do not. Where the bulkheads are not notched the stringer is glued directly on top the bulkhead edge. Note bulkhead C-C is cut in two and forms the dashboard of the front cockpit. Bend the rear hook from .034 music wire and glue it firmly in H-H. Now add the 1/16" sheet fill-in between the stringers at the wing-fuselage and stabilizer-fuselage joints. This is to add to the strength and ease of covering.

The cowl is now carved to shape from a very soft balsa block 2 1/8" x 2 1/8" x 2 5/8". The front of the cowl is a perfect circle while the rear has the same general cross section of bulkhead A-A. Hollow the cowl to thickness shown in the plans and then cut out and add the hard 1/8" sheet cowl bulkhead. Better use several coats of cement at this joint.

Add the 1/16" sheet filler in front of bulk-head D-D. The windshields may now be added; merely form the thin celluloid to shape by rolling it between your fingers. Make the tail from scrap balsa and a piece of wire and cement in place. The hardwood removable nose plug should be made to fit neatly into the cowl bulkhead.

The fuselage is now sanded very lightly to remove any bumps that would impair the covering.

Tail Surfaces

The construction of the tail surfaces is very simple; both the stabilizer and rudder are built in a similar manner. The stabilizer should be built in one piece however.

The leading and trailing edges are 1/16" x 1/8" strips of balsa. The stabilizer spar is 1/16" x 1/8" while the rudder spar is 1/16" square. The ribs are all 1/16" square. When the cement has set, the frames are removed from the plans and soft pieces of 1/16" square are cemented to both sides of the ribs. These are then sanded to a streamline shape after the glue has set. Sandpaper the tips to a streamline shape, too.

Wing

Space prohibits us from printing the left wing plan. You will have to trace the wing plan shown and then invert it to obtain the left plan.

The wing spar should be built first and then the wing is built upon the wing. Build the spar from 1/16" sheet balsa to the size shown in the plans; be sure you cut the correct angle on the spars to obtain the necessary 1 3/4" dihedral. Cut 7 center section ribs from 1/16" sheet as shown in the side view. Slip these ribs over the center section of the wing spar; glue them in proper positions. Add the 1/8" x 1/4" trailing and the leading edge of 1/4" x 3/8" soft balsa.

Make a cardboard template of the outer wing panel rib. With this template slice 14 upper and 14 lower ribs 1/16" square from 1/16" quarter-grained sheet balsa.

Cut the leading edge from 1/4" sheet balsa and pin it along with the trailing edge upon the plans. Now add only the TOP

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ribs, cutting their trailing edges to meet the wing taper. After the cement has set remove the frame from the plan and add the lower ribs in the proper positions. Slip the wing onto the spar and cement each and every rib to the spar. Use several coats of cement at the leading and trailing edges dihedral joints. Cut the wing tip from 1/16" sheet balsa and cement in place.

Carve the landing gear wells from scrap balsa to the shape shown in the plans; you will notice there is a small slot for bulkhead B-B to slip into.

Bend two landing gear struts from .040 music wire to shape shown. The strut is anchored to the leading edge by forcing the end into the landing gear well through the leading edge. Use many coats of glue on this joint. A small block may also be added to back up the joint, as may be noted from pictures of the framework. Another trick is to bind the joint with thread.

The wheels may either be purchased or made from laminations of 1/8" sheet balsa. Cement washers to both sides of each wheel so they will turn freely and true.

Propeller

Carve the propeller from a medium hard balsa block 1" x 1 1/2" x 8". First drill the prop shaft hole and then cut out the blank as shown on the plans. Carve a right-hand propeller. First finish the back of the blades completely and then cut away the front to the thickness required. Use plenty of sanding to obtain a real smooth finish. Apply several coats of clear dope.

Bend the prop shaft from .040 music wire and slip the nose plug and propeller with several washers between them; then bend the shaft end at right angles and force into the hub.

Covering

Sand every bit of framework to remove any flaws and rough spots.

The author used Silkspan for covering his model; however you may use tissue if you prefer.

The wing should be covered, using clear dope as an adhesive. The wings are covered in the conventional manner, applying the adhesive to the extremities only. Separate pieces will be needed for the tips. The tail surfaces are covered in the same way.

If tissue is used many small pieces of paper will be needed to cover the fuselage, but if you use Silkspan the fuselage may be covered in with only two pieces. When Silkspan is wet it may be moulded around compound curves with ease. Spray the covering with water and allow to dry. One or two clear coats of dope may now be brushed upon the covering.

Cement the stabilizer and then the rudder in their proper positions. Small strips of tissue may be doped over the joints to form small fillets. The wing is cemented in place very securely, using plenty of cement at the various joints.

Complete the construction by adding the various details. Thin strips of black tissue should be doped to the covering, representing the control surfaces. The insignia used on the original model was cut from colored tissue and then doped to the covering. Exhausts, tail wheel, painted wheel wells, a radio mast and numerous other details should be added to enhance your Douglas 8A-5's appearance.

Flying

Six to eight strands of 1/8" flat brown contest rubber should be used to power your attack bomber, depending on the weight of your individual model.

Give the propeller a few turns and hand-launch the model over deep grass, if possible. A small lead weight in the cowl will conteract any stalling tendencies. Should your model be nose heavy add a small weight to the tail. Warping the tail surfaces is not advisable as they may change from flight to flight. Once balance is obtained, increase the turns gradually feeling out the characteristics of your own ship.

The original model balanced very neatly on its first test flight; the climb was fast and the glide was a real "floater" due to the large stabilizer.

If the builder has any trouble with any phase of either building or flying his Doug-

P. W.

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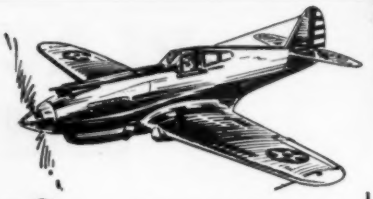

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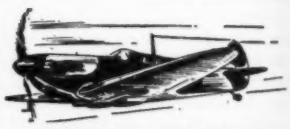

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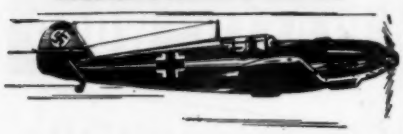

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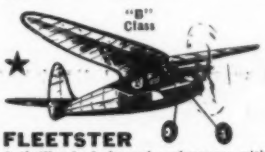

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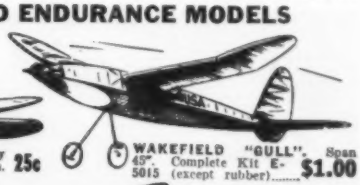

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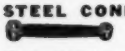

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las 8A-5 Attack Bomber, don't hesitate to write the author in care of this magazine, enclosing a self-addressed stamped envelope and we will try to help you. Happy landings!

Wings at the Nationals

(Continued from page 17)

in a full scale plane, while controlling the ship's flight. All that was required was to operate the stick and the plane responded. Mr. Walker succeeded in turning his plane at will, climbing it and finally bringing it in for a spot landing.

Picture 9 shows an attempt to modify the design of gas models; here we see Irwin Briese of Rochester, Minn., starting his motor for a takeoff. The interesting feature is the "V" stabilizer; this acts as a combination stabilizer and fin, giving great stability to his ship. No part of this tail blankets any other part while in flight.

Picture 10 shows Henry Hyman with his gas job which demonstrates another innovation—wing slots. These are clearly visible along the outer half of the wing and were effective in stabilizing the ship longitudinally and in stalling turns.

Picture 12 was not an unusual sight at the contest. Here Ed Swenton takes out the grass and dirt from his engine, after a vertical dive into the marsh-grass and soft ground surrounding the flying field. From this standpoint the Chicago Model Airport is ideal, for after vertical dives many planes were retrieved in good condition, the impact force being broken by the 6 ft. marsh-grass. In Swenton's case the only damage was a broken propeller.

There were a number of women contestants and the wives of many builders served as official helpers. In picture 13 Mr. and Mrs. S. H. Harper of Chicago prepare their plane for flight.

Another feature was the trailer camp, located about a third of a mile from the flying field. A scene of "trailer life" is shown in picture 4; here a trash-basket serves as a workbench while the youthful builder "takes time out" to greet the photographer. In fine weather this means of visiting the Nationals is far superior to stuffy hotel rooms.

An interesting stick model was Caldwell Johnson's, shown in picture 15. It had an extremely high aspect ratio, approximately 12. The most unusual feature was the one-bladed folding propeller. The blade was freely pivoted and could swing forward or backward, without turning. It was perpendicular to the shaft due to centrifugal force; similar in operation to the vanes of an autogiro, proving very efficient.

The most stable and efficient tailless gas model we have seen is shown in picture 16, with its builder, Ed Manning. Most tailless planes cavort all over the sky, turning one way and then another, with little stability. This ship's flight, however, was perfectly steady; its success being chiefly due to the extreme upturned wing tips. Manning flew three classes of tailless ships.

Picture 17 shows our old friend, Chester Lanzo, starting his scale Aeronca on a test flight.

An unusual flier is shown in picture 18. His ship was extremely steady in flight, probably due to high thrust line and low lateral area. However, its builder made one mistake—he used one wheel instead of two. This ship made six unsuccessful attempts at a take-off; there was a considerable breeze and every time the plane got underway it was turned over, due to lack of lateral support at the nose. With two wheels this plane could have made successful flights with every trial.

Another example of outstanding design is shown in picture 19; here you see John Clemens of Texas with his pod-fuselage sailplane. The motor and batteries are enclosed in a streamlined egg-shaped fuselage directly below the wing. The tail is supported by a single boom running rearward from the center section. It was a beautiful flier.

One of the noted personalities present was Jim Cahill, slightly expanded, for in the last two years Jim has "put on," we would say, not less than forty extra pounds. The picture gives evidence. Here you see him with his latest version of a record-breaking fuselage job that made some beautiful flights.

Ray Beaumont not only flew in the Stout and Moffet Events, but also in the Scale Model Event. In picture 21 you see him with his 44 in. Air Transport scale plane.

Picture 22 shows another fine stick model; here, again, twin rudders are used.

In picture 23 is Earle Arthur, second place winner in the Radio Control Event, with his 9 ft. 5 in. radio job. Though of large span it was powered, and flew beautifully, with an Ohlsson 60. This ship was a close second to Jim Walker in maneuvering and spot landing.

Processing the planes was made easy by the number of gadgets devised by Raoul Hoffman of Chicago, Technical Director for the contest. In picture 24 you see the device used for measuring the fuselage length; this is a factor in determining the correct fuselage cross section.

Many individualistic designs were also seen at the indoor contest. In picture 25 Bruno Marchi of the A.M.A. helps Tom Cunningham wind his indoor stick job. Apparently older builders are not dropping out from the game, but find the sport refreshing after a hard day in business.

In picture 26 we see Carl Goldberg backing up this statement. Here he is helping Jim Clem (left) who flew indoor contest models for the first time. Jim's wing spars are so delicate and fine they hardly show up in the picture.

In picture 27 George Sass, 1940 National Champion, launches his fuselage ship. This featured microfilm propeller, fuselage of triangular cross section and 3-spoke landing gears.

Picture 28 is one of the most unusual ever taken: "Air Trails" and MODEL AIRPLANE NEWS get together when the two editors, Bill Winters and Charlie Grant, shake hands. As a matter of fact, these are old friends; Bill being a valuable asset to MODEL AIRPLANE NEWS' editorial staff at one time. Many builders will remember his excellent articles on flying scale models. Apparently Al Lewis,

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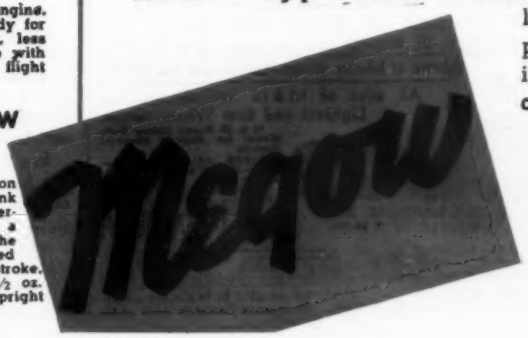

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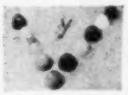

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at left, doesn't trust the situation, for he stands guard with his baton, just in case. Even the photographer at the right senses the humor of the situation.

The Megow Trophy, given to the club scoring the highest number of points, was won by the Junior Aviation League of Boston, under Gunner Munnick's leadership. Picture 29 shows the club proudly displaying the trophy. Leader in number of points was Stanley Stanwick, shown in the center; he won both Indoor Cabin and Indoor Stick Open Events. Travelling from the Naval Air Station at Pensacola, where he was a cadet, he entered the meet with the best wishes of the station commander.

Picture 30 shows Henry Cole with his excellent outdoor cabin job. The fuselage is built up of thin longitudinal stringers around bulkheads, and featured twin fins.

Another example of the "V" tail, this one with cathedral, instead of dihedral, is shown in picture 31, displayed by its builder, Ray Bagdon. The stabilizer tips served to support the model laterally when taking off: the nose being supported by only one wheel.

Eric Anderson, in picture 32, displays his unusual and efficient fuselage design. The fuselage nose is constructed to house the retractable wheel, at the same time providing area below the c. g. to insure spiral stability.

Picture 34 shows a gas model with a similar feature, except it doesn't house a retractable gear; two wheels being used.

A gas job designed by Ralph True, and resembling a flying bus, may be seen in picture 35. It is a low-wing with a single rearward extending boom holding the tail. The fuselage is built in the form of a cabin with windows, the motor being mounted high at the rear, driving a pusher propeller.

These are only a few of the 2,000 planes which were on display. The passing of another year gives promise of many new designs and special features.

We dare to predict that slots will be in more universal use; those who have had experience with properly designed slots will recognize the great advantage they afford. They increase the stability 100% and lift at least 25%; thus a small wing may be designed to do the job of a large one.

If you have new and valuable ideas, do not forget to let other builders know about them through the columns of MODEL AIRPLANE NEWS—we welcome all comments on design, flying rules and other things of vital interest to model builders.

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CORRECTION

We wish to call attention to a statement on page 40, 3rd column, line 13 of the September issue. Here we state "Jim Walker flew a ship of his own design as well as his own radio equipment." This is incorrect. The radio control box was designed by Mr. Walker; however, the radio equipment was designed, produced and supplied by Radio Control Headquarters, 330 W. 42 Street, New York City.

Keep Them Up

(Continued from page 9)

figure 1.

Actually, after assuming some outline, the mean camber line will be completely defined by two numbers; one giving the maximum camber, the other the maximum camber location. In both the four and five number series the first number gives the maximum camber (Ex. *2*409 has 2% maximum camber, while *4*3009 has 4% maximum camber). In the four number series the second number gives the position of the maximum camber (Ex. 2*4*09 has the maximum camber .4 of the chord back of the leading edge). To distinguish between the four and five number series the five number series uses the second and third numbers for position. The actual position being just half the value (Ex. 4*30*09 has its maximum camber .*30/2* or .15 of the chord back of the leading edge).

We have now to consider the streamlining. The fairing used by the N.A.C.A. is shown in figure 1a. The curve is a mathematical approximation chosen to fit the fairing used on a family of airfoils including the Clark Y and the Gottingen 387. In both the four and five number series the last two numbers are reserved for the designation of the thickness of this fairing (Ex. 24*09* has a thickness of 9% of the chord). The nose of the streamlining may be slightly modified by the diameter of the leading edge circle as shown in figure 1. (0006 B having a large leading edge circle; 0006 T having a small leading edge circle.)

Now for the aerodynamics. We found in Part I that there was one outstanding criteria for endurance models. The power required factor $C_D / C_L^{3/2}$ must be as small as possible. It seems more significant to talk about the reciprocal, $C_L^{3/2} / C_D$, the endurance factor. When properly totaled to include drag of fuselage, tail, etc., this will be directly proportional to the dead air endurance of geometrically similar models. Note the endurance factor is similar to the gliding ratio; the endurance factor determining the time for glide, whereas the gliding ratio only determines the gliding distance. If one model has an endurance factor of 10 and another a factor of 15, the second model will have a glide of 50% greater duration. (The climb will also be better, as will be discussed in a later article.)

We would also like to give curves showing C_L and C_D. However, examination of only one set will give us considerable insight into what is happening. Figure 2 shows the flow about a thin symmetrical airfoil (006) at a high attack angle. The change of curvature around the top surface is so abrupt that the flow leaves the surface

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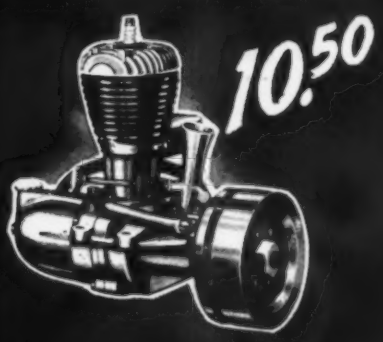

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immediately. Lift and drag curves are shown in figure 3. Note the low lift and high drag just where we would like to fly (6° to 12°). Study shows three solutions We might increase the camber, increase the thickness or increase the leading edge circle. Either will give the improved curves similar to those shown in figure 4. Actually we shall see that increasing the camber is more desirable as with increasing thickness the streamlines have more and more difficulty in getting together at the trailing edge.

The variation of endurance with thickness is shown in figure 4. Thick sections are obviously very inefficient. We must use as thin a section as is structurally feasible providing, of course, that it is combined with sufficient camber to prevent separation.

You have probably noticed by this time the variation among airfoils is not very great; the best airfoil being only 30% more efficient than the worst. However, we must remember two things: *first*, these are all good airfoils, the mean camber line and fairing both being excellent. Probably few of the thousands of airfoils which have been tested would even lie in the range covered by figure 4. *Second*, we shall see that the variation becomes greater at low speeds. So that, all in all, it is decidedly worthwhile to carefully choose an airfoil section.

Figure 5 illustrates the same points replotted to show the effect of camber. As might be expected camber has little effect on thick airfoils, while a 6% thickness requires at least 4% camber to prevent separation. When the maximum camber is far forward considerably less camber is needed.

Which brings us to a discussion of the optimum location for the maximum camber. The data is not complete but the general trend is shown in figure 6. The optimum location for the five number family being about 15% back (43009 e.g.) while with the four digit family the optimum location is about 35% back.

FIGURE 7

Ordinates for the NACA 43009

Station	Upper	Lower
0	—	0
1.25	2.73	−0.51
2.5	3.76	−0.50
5.0	5.30	−0.30
7.5	6.27	− .13
10	6.98	− .06
15	7.69	− .33
20	7.83	− .78
25	7.78	−1.16
30	7.60	−1.41
40	7.02	−1.70
50	6.19	−1.75
60	5.20	−1.65
70	4.09	−1.41
80	2.88	−1.08
90	1.65	− .64
100	—	0

The five number family is obviously superior. This may seem to contradict our original findings covering leading edges. However, with the five number series the maximum camber should be less so that the resulting slope of the extreme leading edge is about the same. As it seems separation will eventually occur whatever we do, only the extreme leading edge is really important.

The five number series also has another major advantage which we must mention before closing. The straight aft portion of the mean camber line gives a small C.P. travel so that our models can have a very small tail and thus a higher overall efficiency.

In summary, the best airfoil examined would be one of the four or six per cent camber, five digit series, as thin as is structurally permissible. The writer's personal choice would be the 43009. Ordinates are given in figure 7.

In Part III we shall show the variation of the endurance with regard to model size and speed and present data which may be actually used in design.

Model Methods

(Continued from page 22)

Work the razor chip through the exact center of the "table" so that its point extends 1/16" below the under surface of the "table." Cement the guide to the under side of the table so that the edge facing the razor chip is exactly 1/16" away from it. When dry, give the top of the "table" (including the razor chip) a coat of cement. Shape the balsa "holder" as per Fig. 4, then cement it to the top of the "table" and to the side of the razor chip. Allow to dry.

When making the other sized slicers, the same type and size materials may be used, the only change being the distance of the razor chip from the edge of the "guide." For the 3/16" and 1/4" slicers it is necessary to use a wider "table."

The National Contest Was Great

(Continued from page 25)

the Class B category. Absolute "hands-off" takeoffs were enforced rigidly by competition officials from the Chicago Park District and a very pretty and effective sight would be several gas models taking off at the same time, with no assistance, from different runways and starting their climb normally.

Several master books, 3 feet by 3 feet, carried the names of all contestants as well as all information concerning entry fees, events entered, addresses, club affiliations, and so on. Hundreds of models were returned to the outdoor field after flying from the officials' sight. The Greater Chicago Radio Council cannot be too highly complimented for its excellent work in retrieving these models and this represented another instance in which hobbyists can work together for the benefit of their respective interests.

Ralph Brown of Boston, who placed 2nd in the Moffett finals, had his entry returned by the radio cars three times—each time after an official out-of-sight flight. Jim Bohash, mentioned earlier, made a record of comments by Dick Everett and Earl Stahl which will be distributed to A.M.A. chapters. Inasmuch as the conversations were recorded on the field with background noises of contest activity, it is expected the transcription will be of special interest.

The A.M.A. contest board meeting and annual business meetings were marked by their orderliness and lucid thinking. Con-

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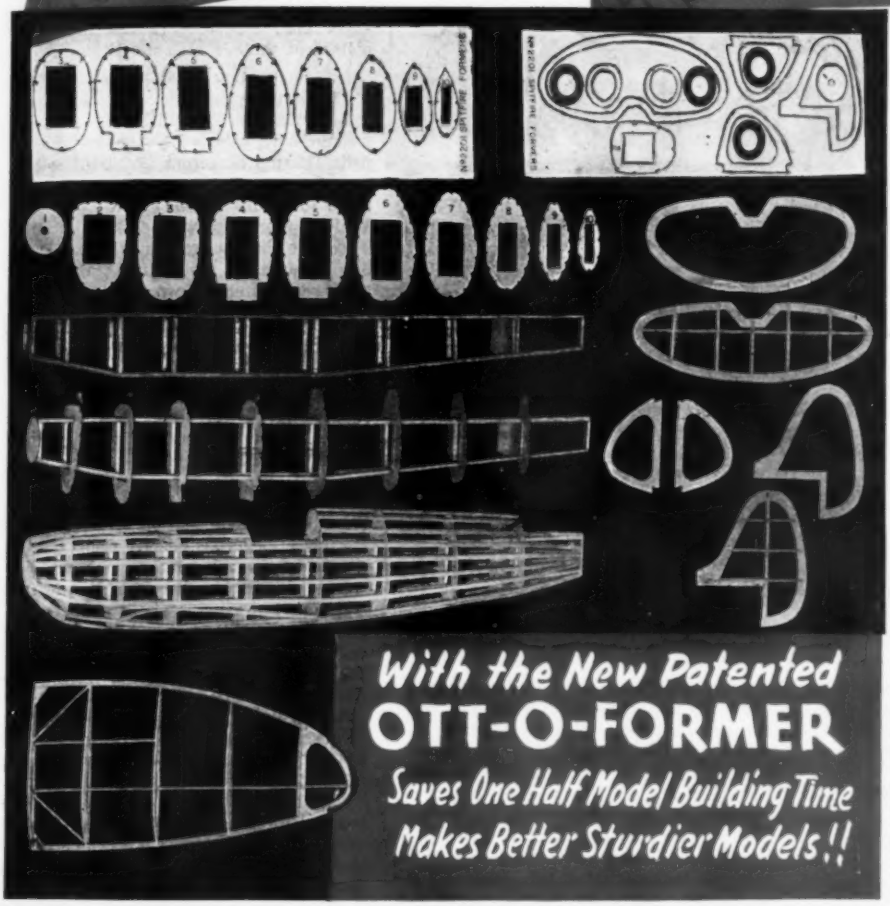

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testants and officials were given opportunity to express views on rules and meet procedure, and the association of ideas and reports on activity were of upmost importance.

The double-decker buses which transported entrants to the flying site each morning and returned them to the Sherman at night were the center of interest . . . especially when they went under low bridges and trolley wires! But no difficulties were encountered other than slight deafness caused by exuberant flyers running their gas motors in the bus.

Bigger and better rubber powered models were found . . . some of the cabin models were "souped up" with a great many strands of rubber for motive power and constructed like gas jobs. Several low-wing gas models performed creditably and Ed Manning's tailless gas model flew, to the astonishment of many "doubting Thomases." Mr. Manning was with the Detroit delegation which tried hard but had to concede first place team honors to the Junior Aviation League fliers of Boston.

The radio control models drew the biggest crowds and this year's performance exceeded all previous attempts. Frank Zaic, as one of the "r-c" judges, contracted a beautiful sunburn across the bottom half of his face which gave him a fashionable two-tone color combination.

All the contestants seemed to do exceptionally well with a minimum of sleep and one could find a group almost any time of the morning (even 4 a.m.) out in front of the Sherman discussing the relative merits of lifting stabilizers or shorter engine runs.

The "Daily Blurb"—the national meet banquet fun sheet—was a masterful job edited by Tom Cunningham of Chicago, now an Army private at Fort Sheridan. Lee Gerlach of Washington drew the Blurb's cartoons.

About the only bad feature of the meet is that you couldn't get to see everybody so the opportunity is taken here to extend the Instructor's hearty congratulations to all national meet contestants—those who finished first and those who finished last.

As Maurice Roddy, aviation editor of the "Chicago Times," said—see you next year.

"Old Trusty"

(Continued from page 19)

for more gas job failures than anything else. The Sport Trainer has been adjusted to fly in fifteen foot circles and shows no tendency to spiral dive, which proves the center of lateral area is correctly placed in relation to the center of gravity. Its rudder area is also correct, which makes the model very easy to adjust.

Since trees, barns, etc., usually manage to get in the flight path of any gas job at some time or other, ruggedness and strength play a very important part in the gas model's design. The Sport Trainer has proven that it possesses this quality to a high degree; it has hit trees, brick walls and numerous other objects and has also had its share of motor failures on the take-off, but has never suffered more than a broken prop. We believe the model is practically immune to major damage from anything it could encounter in flight.

Now that you have learned what to expect of the Sport Trainer, we will begin discussing its construction. Plate four contains instructions for building a streamlined version for those who like this type of model better than the more realistic type. Since both versions are basically the same, the following description will apply to either one; except for a few details explained at the end of this article.

The Fuselage

The first step in building the fuselage is enlarge the plans to full size. All wood is medium-hard balsa unless otherwise specified. The top longerons are 3/16" x 1/4", and placed as shown on the drawing. The lower longerons and all bracing around the landing gear and wing mount are 1/4" square, while the rest of the bracing is 3/16" square. Be sure to make a right and a left side. After the two sides are finished, they are joined with 1/4" square crosspieces.

When the sides are joined and the gussets around the landing gear are in place, cement a 1/8" x 1/4" strip along the outside of each lower longeron from stations 1 to 6. After the cement has dried, taper each to a feather edge at station 6. Taper the 1/4" square bracings slightly where they join the top longeron, and also at the lower longeron at station 6. Do not sand the lower longerons quarter round until all the fairings are in place.

Before going further it is best to start on the wing mount. The struts are constructed of 1/4" x 1" hard balsa and cemented firmly in place. Since this part of the job must be done accurately, the plans should be studied carefully until its construction becomes perfectly clear. The top members of the wing mount are made of 1/4" square spruce. These should be cemented and nailed to the balsa main struts.

The motor mount is made of 1/8" plywood with aluminum angles bolted on. Be sure to make the motor mount to suit your motor. Small clamps may be needed in cementing the motor mount in place. The landing gear is bent up of 1/8" diameter music wire and bound to the crosspieces with heavy thread coated with cement. All formers and fairing strips are now cemented in place, and the nose blocks carved out of soft balsa. The fairing strips on the fuselage bottom were omitted from the drawing for clearness. Notice that they lie flatwise. The tail skid is made of spring steel (a watch spring will do) and bound to the fuselage rear with thread.

The entire fuselage, except for the top between stations 2 and 8, are now covered with bamboo paper. As noted, covering is kept completely off the structural members by the fairing strips, producing a very smooth covering job. The fuselage is covered with as large a piece of paper as possible; thinned out cement makes a good adhesive. The fuselage top is covered with heavy paper and is made in four pieces. After the top is covered, lay out the cockpit and cut it out with a razor blade. This heavy paper covering simulates the metal cowling of a full size airplane. To make the windshield, cut the frame out of heavy paper and cement a piece of celluloid, cut to the outside shape of the frame, on the

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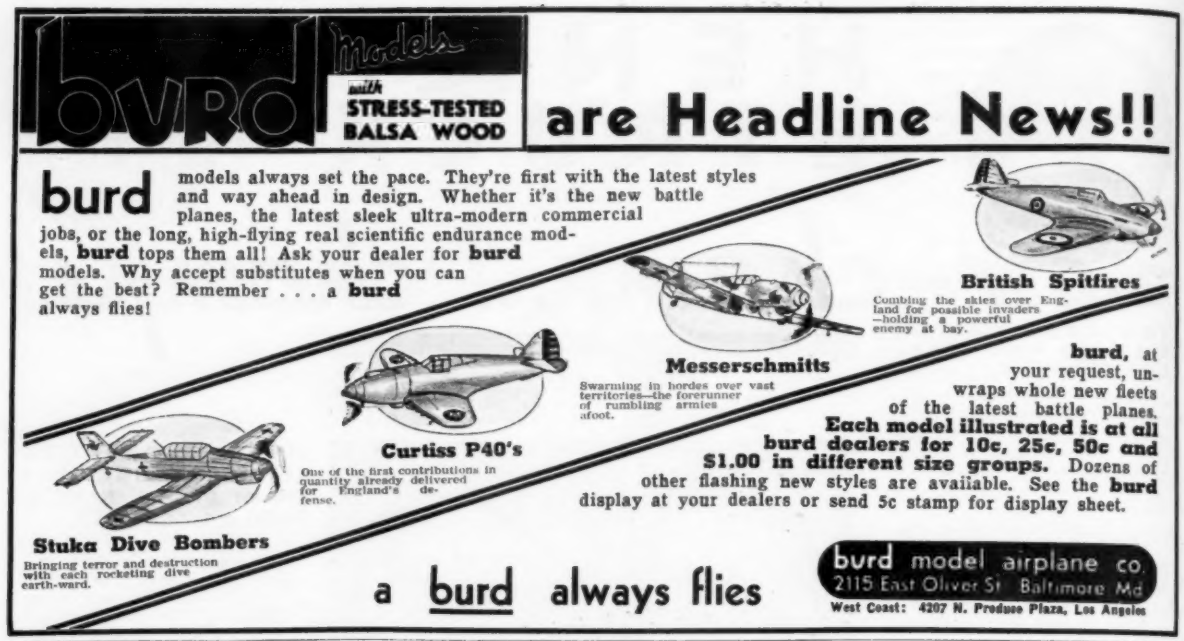
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back of it. Use cement sparingly so as not to smear the celluloid. Now bend it to required shape. This is known as a military type windshield. The headrest is also made of heavy paper. The position of the batteries and coil will depend on the weight of the motor used.

Wing and Tail

With this type construction a full size wing drawing is unnecessary. The first step in the wing construction is cut twenty-three ribs out of 1/16" sheet, and sixteen 1/6" x 27/32" x 2-15/16" web pieces. To assemble the wing first place the 1/8" x 1/4" spars in the rib notches. Place a web piece between the spars and next to the rib, keep adding ribs and webs until there are nine ribs with webs between them in each wing half. Let the 1/8" x 1/4" spars extend sufficiently on each end for construction of the spar joint and wing tips. The 1/4" square leading edges and the 1/8" x 2" trailing edges are now cemented in place. The wing tip is constructed of 1/4" sheet and cemented in place so that it meets the top spar. The lower spar is cracked at the last full rib and brought to meet the top spar at the tip. The tip rib is shaped after it has been cemented in place; 1/16" webs are inserted between the spars and ribs at the tip. Each wing half is now completed except for the balsa leading edge covering, which is not put on until the halves are joined.

To make the spar joint, first cut the spar joiners out of 1/4" and 1/16" sheet. Now raise each wing tip 5-1/2" and cement the joiners in place, using plenty of cement. The five remaining ribs are cut in two and cemented on each spar side. The leading and trailing edges are now joined. The leading edge up to the spar is covered with 1/16" sheet and the 1/16" x 1/4" capstrips are cemented in place. Now round the leading edge, taper the trailing edge and go over the entire wing with sandpaper. The wing is now covered with bamboo paper and doped. This method of construction produces an exceptionally strong wing for its weight.

The stabilizer is made in one piece and cemented on the top longerons after it is covered. A small block is cemented on the stabilizer top and shaped to carry out the fuselage lines. The rudder is cemented on this block. The rudder tab is made of 1/4" sheet and soft copper wire is used as a hinge.

The Streamlined Version

The chief difference in the streamlined model is the wing mount. The main structural mount member is cut out of 3/16" plywood to shape shown on plate four. The member on which the wing rests is also 3/16" plywood and is cemented and nailed in place. It is rectangular in shape. The fuselage cross-members at the top longerons are 1/4" x 2" balsa. The formers are cut in two and 1/16" cut off all around to allow for the 1/16" sheet balsa covering. Before the fuselage is covered, the plywood main structure is cemented in place. The formers come next and the whole fuselage top between stations two and eight, is covered with 1/16" sheet balsa. 1/4" sheet is cemented on each side of the plywood, and fillets of soft balsa are made. The whole fuselage, including balsa top and wing mount, is covered with bamboo paper The rudder is changed slightly as indicated. Pants can be made of 1/4" sheet balsa if desired.

Flying

Shift the batteries so the model will balance when held one-third back from the wing leading edge. The model can be glide tested, but little can be learned from this unless you climb on top of a house to glide it, and then you might as well fly it. Set the timer for about ten seconds and have the motor running slowly. Hand-launch it into the wind. If your model is properly constructed it should fly and glide almost straight. Torque does not have much effect on it so the motor should not be offset. All adjustments for circular flight should be made with the rudder tab. There should be no wash-in or wash-out in the wing. The original proved to be a fine flyer and we hope yours will be the same. Good luck.

Frontiers

(Continued from page 31)

have become more definite: Where once a pilot would warm up his engines with his airplane heading into the wind whenever it was convenient, it is now a case that he MUST head into the wind. Odd as it may seem, this is difficult to impress upon a pilot. The reason is, however, that our high-powered engines of today have become double-banked and the cowlings are tight fitted to gain the most of speed. Carburetor air intake, oil and coolant scoops are smaller because of the higher speeds attained, and that added breeze from the wind always helps keep the engines "cool" during warm-up. We might add here that engineers have more success than might be ordinarily expected in designing engine installations that remain cool on the ground as well as in the air when travelling at high speeds of 400 m.p.h. or more. There is a big range of difference there. Engines have now become so large and powerful and are required to supply power for the operation of so many other systems in the airplane; such as electrical, cabin heating, gun heating, gun turret operation, gyro and other instruments, the various fuel and oil pumps and the numerous hydraulic systems, that engines must be operated with extreme care. Even today we hear stories of student pilots becoming nervous on landing our big bombers and pour on the "gun" for another try, raising the manifold pressure up to about 50 in. Hg which is almost enough to blow the insides out of the engine. Operation should be smooth and steady and a DEFINITE procedure must be followed.

The military aircraft, because of foreign

competition, has become a highly technical mechanism and in many cases is very complicated, especially within the pilot's compartment. In flying these a pilot must take the same attitude as a captain would of his ship. A procedure must be adapted whereby precautionary measures are taken to prevent any malfunction rather than to be prepared just in case of malfunction. On some of our big military planes it is almost humanly impossible to maintain everything in proper operating order unless a definite routine check is accomplished. Normally the pilot's operation checkoff list on a large transport or bomber is about four pages long, including instructions for starting, takeoff, climb, cruising, landing and stopping. Many safety and automatic devices such as the constant speed propeller governor and automatic mixture control have been created, and crew chiefs, officially known as aerial engineers, accompany the pilot and co-pilot to check proper operation of the bomber's equipment, which lessens the pilot's headaches.

However, if operations of safety devices are not properly understood they may be more dangerous than safe, and then again, the crew chief must have his definite procedure. This procedure should be worked out as complete as possible by the manufacturer during the design of the airplane and presented at the same time of the planes delivery. Revisions should be made during the accelerated service tests. Live or not live depends on how the plane is flown, and naturally the pilot is interested in flying safely. But he cannot do this unless he receives detailed instructions from the manufacturer or finds out the hard way by extensive operations of the parts. Likewise, service routine comes under the same category and thus it becomes the manufacturer's engineer's or designer's obligation to formulate a complete procedure for the ship's operation.

At the present time, very few U.S. aircraft manufacturers have given much time to either operation or service prior to actual delivery of the airplane, and only what was absolutely necessary afterwards. They were justified in this in the past because the number built was in small quantities and they were placed in the hands of very experienced pilots and mechanics who had time to make personal studies. Unsatisfactory reports issued to the manufacturer would take care of any service and operation malfunctions found during the operation; then the engineers with the manufacturer would redesign the malfunctioning part for better service.

Quantity production now comes into the picture, and this is the big item of conjecture. Will the present attitude suffice to insure proper operation and service of these thousands of new airplanes? The answer is definitely "NO". We will soon have in our air force many thousands of rookie pilots and still many more thousands of rookie mechanics with inexperience their prime characteristic. They will have charge of the greatest mass of complicated flying equipment of the most powerful and "ferocious" caliber ever before assembled in the world. The possibility might well exist that the papers throughout the country might contain a small item of a crash in their respective locality when these thousands of planes take the air for strenuous war maneuvers. They may seem insignificant at first, but when they are all added together in one bunch it may amount to a high toll; it might even surpass the loss of life that would actually occur in battle! It is not enough to take precautions against this. We must make CERTAIN it will not happen!

To accomplish this the manufacturer must produce a detailed maintenance check sheet and service instructions that will cover his product fully. This is already a requirement, and the U.S. Air Corps publishes the material in the form of Technical Order System. But if all the material compiled by the aircraft manufacturers as well as the engine and accessory manufacturers was put in one heap, you would have the worst imaginable disorganized mess of incomplete and misinformation! We have found that some engineers did not even know that information in Technical Orders were issued by their own company. Thus this information was compiled to fulfill a clerical requirement and the proper amount of time for keeping material up-to-date was not applied. Where it was once a case that the mechanic would practically "live with" his one or two airplanes at the base and work on them only when Major Garnshwabble thought he would not fly that day, he now has a thousand super-colossis lined up on the ramp.

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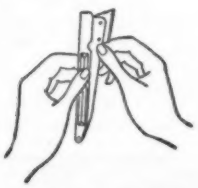

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The 25, 50, 100, 200 hour inspection periods, etc. must be performed as required in "Detroit assembly line methods." The airplane must be divided into inspection areas and the inspection, including lubrication, must be performed precisely as directed in order to prevent the occurrence of malfunction and possibly much grief at a future date. It is only in this way that such a great mass of aircraft can be flown safely. It is, of course, the engineer's dream that some day a plane will be designed that will require little or no servicing. That day is still far away, and it is therefore necessary that the element, known as inspection, be instigated in order that we can achieve safety for our military pilots. The engineer must think in terms of these inspection periods, must design his equipment so they will most readily be serviced and he must provide the mechanic with the proper operating and service instructions. He has the means of doing this. The system is all set up, but it lacks pressure behind it. It means a forceful movement to change his habits and methods. Our new factories are built and the designs of new aircraft are well towards completion. The major production problems have been surmounted, and now is the time to place more emphasis on inspection.

If one does not have a clear idea of what servicing and its problems amounts to we will give the following example:

We might consider just one of the many operating systems in the airplane, such as the fuel system. The engine driven fuel pump may be hydraulically driven, interconnected to the engine by a flexable shaft or it may be geared directly to the engine. The hydraulic generator that supplies the fluid to operate the pump may malfunction, hydraulic lines may break; and the hydraulic reservoir must be checked regularly for level of fluid. The flexible drive shaft may break or the gasket on the pump mounted on the engine may leak. The fuel lines, which are usually of the rubber, self-sealing type to safeguard against bullets, may collapse, deteriorate or become worn from chafing. The fuel booster pumps may malfunction or fuel may leak out and short circuit the electric motors that operate them. Numerous check valves may become clogged, cross feed and selector valves may become damaged, flapper valves within the tank may cause trouble, and the tanks alone, whether it is of the integral structure or self-sealing type, is enough to make the mechanic and designer alike "go mad." The mechanism for dropable fuel tanks requires attention as well, as draining the system at designated intervals to remove the accumulation of water and foreign matter. One of these new injection carburetors can cause all sorts of grief. But that is only the fuel system on the airplane; there are thousands of other items that may cause trouble of the same sort unless proper inspection is made. Thus, for the sake of aviation, let us foster a movement to make our flying equipment safe to operate before the damage is done.

And now for a quick glance at the new aircraft. . . . Lockheed is now rolling the P-38 interceptors out at a fast pace, and they are wearing their drab-appearing war paint. The North American "Mustang" has also become the victim of camouflage, which entails more work for the artist in that it consists of two shades of green and brown on the side and upper surfaces, light gray below along the belly of the fuselage and wing. The U.S. Air Corps ships are of an earthy color throughout. Pilot Chilton recently put the "Mustang" through its paces for the benefit of the public; doing everything, including a wide sweeping loop of approximately three thousand feet in diameter.

Curtiss's new SNC-1 has also undergone its tests and has been accepted by the U.S. Navy as an advanced trainer. It is powered by a 450 hp. Pratt & Whitney Wasp engine. Harlow Aircraft has completed a new training airplane with tandem seating. It has a large Lycoming radial engine in the nose and may even carry a still greater horsepower engine in the near future so as to make itself well applicable to a varied assortment of engines. This is important in the present crisis where engine priorities may make it difficult to acquire a certain make of engine. The airplane is of completely new design, incorporating many features of past Harlow airplanes.

In Great Britain another new, sleek twin engine fighter has been launched against the "all-conquering" Germans. It is the "Beaufighter" built by Bristol, and is a counterpart of the "Blenheim." The long fuselage is just wide enough for a pilot, with a nacelle in the wing at each side containing a radial Bristol sleeve-valve engine. The little ship is plenty fast and will give the Luftwaffe first class trouble. Of mid-wing design, it portrays exceedingly trim lines and has started out in life with a single rudder tail. Whether this will grow into a whole family is not for us to decide. No doubt the Beaufighter is a follow-up of the Beaufort torpedo bomber. Great Britain, in giving her airplanes names, has made it simpler for the not-always-understanding public to distinguish one plane from another. For that reason the U.S. Air Corps is considering naming our new military aircraft in like manner.

The new Ford engine now under design will produce close to 1,800 horsepower from its twelve cylinders. Even though it will not be as high powered as some of the new radial engines, it will make up for this by having a much lighter gross weight. This venture of Henry Ford's should prove very interesting.

Howard Hughes has now moved into his new plant in California and is well underway with his new fighting plane. It will be one of the fastest to hit the air. The designers have placed much emphasis on streamlining, and there will not be as much as a rivet head projecting from any surface. Frontal area will be down almost to a knife edge. The smooth surface the plane will have indicates the use of plastics. However, you can well rest assured that it will be a super-super airplane.

If you would like to establish a model airport in your community write care of Gas Lines giving full particulars of available ground, number of model builders, etc.

Rocketing your plane INTO THE BLUE high and fast—is easy with Super ATOM!

Check Super ATOM, point-for-point, against your personal check-list of features a really modern engine should possess:

(1) **WEIGHT:** 2 ounces. (2) **BORE AND STROKE:** ½", .097 cubic inch displacement! (3) **POWER:** Greatest power-to-weight ratio ever achieved in ANY engine! (4) **STARTING:** 1 or 2 flips and up she roars EVERYTIME—quickly, easily! (5) **CYLINDER:** Everlasting steel, precision engineered. (6) **PISTON:** Individually matched, fully lapped. (7) **EXHAUST:** Exclusive CircATOMic exhaust ports, circles the cylinder for lightning fast ejection of burnt gas residue—increases power! (8) **TIMER:** Perfect function at all speeds, no wasteful power drag. Perpetually self-adjusting. (9) **HUBSHAFT:** Unique design cushions difficult landings, reduces bent and broken crankshafts with enormous economies.

It all adds up to this: Your ATOM will outpull, outclimb, outfly any engine up to almost twice its displacement ON A GUARANTEED MONEY-BACK BASIS! When so much costs so little, why take less? Immediate delivery from your dealer or direct: Complete with coil and condenser, $15.50.

ATOM

KEEP 'EM FLYING Longer!..with

Hats off to the Flying Cadets!! We're glad to see America "keep 'em flying" with the best of training and material.

BATTERIES DESIGNED FOR GAS MODEL IGNITION

Uncle Sam provides his "Flying Cadets" with the best available, to make them top-notch winners. Make a winner out of your model by supplying the necessary "hot-spark" you get from these specially designed model ignition batteries.

No. 2Z2PI. Light weight, weighs only 2¾ ounces. Packed with power and long life. Plug-in socket assures perfect contact for maximum efficiency Price 50c.

No. Z cell. For class "A" jobs. Special Burgess "hot-spark" mix with seamless drawn zinc can gives longer life, adds pep to your motor. Light weight, weighs only ½ ounce. Price 5c

No. 4F2H is the ideal "booster" Compact, with no extra bulk, and simple easy connections. Lighter than two old round No. 6 cells. This battery has a more sustained working voltage, made possible by having 12% more active zinc area. Price 75c (west of Rockies, 80c).

BURGESS BATTERY CO.
FREEPORT, ILL.

BURGESS MODEL IGNITION BATTERIES

Silent War Wings

(Continued from page 7)

he will be able to carry a passenger. Like most modern sailplanes, this Bowlus, because of the unusual length of the ailerons, has two control horns mounted on the ailerons instead of just two, one near the tip and the other further inboard, and they are interconnected to a cable that leads inboard to the control stick. Spoilers are mounted on the upper surface of the wing. A combination wheel and skid arrangement is provided in the pod fuselage belly.

One of the smallest sailplanes yet seen in soaring circles is the new "Screaming Weiner" built by the Crown City Glider Club of Pasadena. It is perhaps as small as could be built; having a high wing loading it is a very fast ship. Of mid-wing design it looks like a flying bullet and makes a screaming noise when it glides through the air, which accounts for its name. It is only single place, and, though small, has excellent flying qualities and can match the endurance of its competitors. "Letter box"-type fixed slots are located out near the wing tips.

Another full cantilever, mid-wing sailplane is the Volmer J-10 built by Volmer Jensen. It is exceedingly larger than the "Screaming Weiner," with side-by-side seating. The wing has a high speed airfoil with a high aspect ratio, giving promising performance. Still another new sailplane is the high-wing, strut-braced ship flown by Herman J. Steiglmeier, brother of the well-known Henry Steiglmeier, former model builder. Henry recently made a spectacular flight to an altitude of 20,000 feet in a Baby Albatross without any oxygen . . . or fur coat. The last stages of the flight were more or less involuntary as he nosed the little ship straight downward but rising air currents still added to the plane's altitude. The lack of oxygen at the high altitude made the pilot too weak to turn off his radio which was receiving nothing but static as the ship bounced around in storm clouds between thunder, lightning, rain and icing conditions. The flight certainly speaks well of the ship's construction, considering what it went through. Though they appear to be light and frail craft they have a sufficient surplus of stamina.

One ship that typifies the ruggedness of the modern sailplane is Alan R. Essery's "Baby Bomber," a consistent performer and subject to many takeoffs and landings in a day. It incorporates a large streamlined fuselage resembling a big bombing plane; yet it has a small Baby Albatross wing. Seating is side-by-side, and in spite of the heavy load, performs very well. This is one of many examples to illustrate the best sailplane is not the one with the longest sweeping wingspread but one of medium size with an added touch of speed. The "Baby Bomber" single landing gear wheel is retractable in flight and the ship is landed on a skid in the fuselage belly.

Before closing the soaring situation we would like also to pay tribute to the fine little Aero I.T.I. sailplane that has now been flying for some time; this is an excellent all-metal high-wing ship that always puts in a good performance. To get the greatest aerodynamic efficiency, its operators always make certain that the ship is well deleted of dust on its outer skin. This has become an item of extreme importance with new high-speed aircraft now being built, especially those with laminar flow airfoils. Some of the new high-speed airplanes actually develop dangerous stall characteristics if their wings are not washed clean.

The use of gliders in the Crete campaign will undoubtedly give impetus to soaring in America, and steps are now being taken to create a fighting force of silent wings.

Air Youth of America

(Continued from page 33)

this country by enemy planes.

Aircraft spotting is a job for which model builders are well adapted, especially those who have done work on military scale models. The idea is: To cover all necessary territory, the Air Corps must call on a lot of civilian volunteers; these volunteers will man stations assigned to them, telephoning information on the planes observed to a central headquarters. In some parts of the country local clubs have volunteered as units to work with the Interceptor Commands.

It's a job that offers opportunity for an exciting type of activity, as well as a chance to associate with the "big fellows" of aviation. If your club is interested in finding out about this volunteer work, get in touch with your local or state defense council. In case you don't know how to reach this group, ask your local American Legion headquarters; they are likely to be working at the same project too.

Club Builds Own Weather Bureau

Another interesting project for aviation clubs is one which was worked out at Suffern High School, Suffern, New York. It is a homemade weather bureau, made of materials that cost no more than a dollar. Knowledge of weather and its fluctuations is essential to model builders and plane pilots alike, and here's a chance for a fine project in building an inexpensive weather station. The Suffern High School Club built a barometer, weather vane, hygrometer, wind velocity device and several other gadgets. The equipment can be made more or less elaborate, depending on the club's interest and finances.

Recordings of weather conditions can be kept for a period of time and comparisons made with the weather charts issued by the local weather bureau.

A Homemade Flight Trainer

We learn several types of inexpensive, homemade flight trainers have been developed, useful for club groups. Every model builder is potentially the pilot of a plane and there's lots of fun and valuable experience to be gained by having a training device that will give members the "feel" of handling a full scale ship.

Members of the Aeronautical Society of the Bronx High School have devel-

A REAL GASOLINE ENGINE $5.95

Here is your opportunity to buy a kit of the famous G.H.Q. Gasoline Motor. ABSOLUTELY COMPLETE—ALL MACHINING DONE—READY TO ASSEMBLE. All you need is a screwdriver. No mechanical knowledge required.

A large bore, 1/5 H.P., engine at a lower price than any small bore engine. Complete with Coil and Condenser.

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ABSOLUTELY COMPLETE

Everything is in the kit including Champion spark plug, COIL, CONDENSER, tank and cap, ignition wire, cylinder, piston, connecting rod, timer, crankshaft, all screws, nuts, bolts, simple illustrated instructions, etc. Every part is fully machined and finished. A SCREWDRIVER IS THE ONLY TOOL YOU NEED.

EXACTLY THE SAME PARTS THAT GO INTO THE G.H.Q. ASSEMBLED ENGINE.

AN ENGINEERING TRIUMPH . . . Never Before at So Low a Price!!

Indeed an engineering triumph—accomplished by outstanding G.H.Q. designers and engineers, who have constructed into the G.H.Q. motor everything that years of exhaustive scientific aerodynamic research could produce—geared to the highest possible degree of perfection. But more than that, the acid test . . . an overwhelming response. Thousands of users in all parts of the country are praising, recommending, and endorsing this scientific achievement. It seems as if everyone in America wants one. The most hair-raising thrill you've ever experienced will be yours with the G.H.Q. motor—actually one of the most powerful motors ever constructed. Has broken records for amazing performance.

30 MINUTES TO ASSEMBLE

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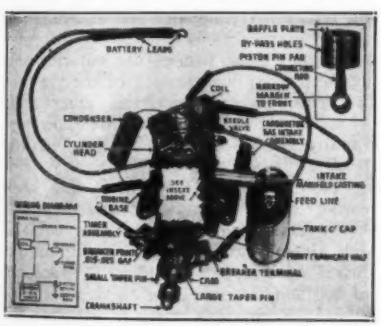
ALL PARTS WARRANTED

Imagine operating your own G.H.Q. ⅕ Horse Power gasoline engine—small enough to fit in the palm of your hand—yet turning up over 7000 revolutions per minute and powerful enough to fly model airplanes of from 4 to 10 foot wingspan, and propel model boats from one to six feet in length and midget cars that travel over fifty miles an hour!! There are also hundreds of other ways you can enjoy using this miniature yet powerful power plant—for small pumps, generators, compressors, blowers, fans, grinders and countless other experimental purposes.

Your G.H.Q. gasoline engine will be far more than just a toy for your spare moments. It is a scientifically constructed mechanical marvel that will thrill you with thousands of hours of pleasure. You will get a real kick out of controlling with your finger tip the surge of power your engine develops.

This engine has been tested and proven over the last eight years, OVER FIFTY THOUSAND OF THESE POWERFUL LITTLE G.H.Q. ENGINES ARE NOW IN ACTUAL DAILY USE. Why not join the ranks of these hobbyists?

ALL PARTS FINISHED & GUARANTEED



ENGINE IS COMPLETE and Ready to Assemble

Your engine comes to you with every part completely finished. Our factory-trained skilled mechanics, using the latest automatic precision machinery, have finished each and every part to the last detail. You merely assemble the parts in accordance with the few simple instructions given, using only an ordinary screwdriver, and inside of thirty minutes, your engine is ready to operate.

Not only will you and your friends have the thrill of seeing an engine ASSEMBLED BY YOURSELF operating, but you will gain a knowledge of gasoline engine theory and practice that will be of real practical value to you.

SPECIFICATIONS OF NEW 1942 MODEL

4 Port 2 Stroke Cycle. ¾" Stroke. 15/16" Bore. 300-7,000 R.P.M. Bearing Surface, 1¼" Long. Crankshaft, 5/16" Diam. Rotation, Either Direction. May be run inverted. 1/5 Horsepower. Class C under NAA Rules.

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The only nationally advertised $5.95 kit that includes a coil, condenser and wires.

Identical Engine Less Coil & Condenser

$4.95

G. H. Q.'s EIGHTH YEAR!

Thousands of Satisfied Users! Read some of these testimonials on file with us:

J. B., Providence, R.I.—"A few weeks ago I received the G.H.Q. motor kit and it is running perfectly. I hope to write you soon and tell you about some excellent flights."

R. H., Prairie du Chien, Wis.—"Your motors sure can take a lot of abuse and knocking around and yet perform perfectly. I have had two in a period of about two years and have seen higher priced motors give less service and performance."

W. W. W., Russellville, Ark.—"I received my G.H.Q. Motor Kit and am very well pleased.

W. L., Claysburg, Penn.—"A wonderful motor that thrills any air-minded person. Strong and neat looking. As good as motors costing twice as much."

A. K., Hillside, N.J.—"I still can't understand how you can put such a dependable and rugged engine on the market at such a low price."

E. T., Sayville, N.Y.—"Received my G.H.Q. Kit okay and am more than delighted with same. You've got 'em all beat for price and performance."

R. P., Hamburg, N.Y.—"I want to extend my personal thanks to G.H.Q. for their prompt service. The motor I ordered was received within 24 hours. Such service cannot be surpassed. I also want to say that I have the motor running perfectly. I shall do all I can to help promote the success of G.H.Q."

H. H., Midlothian, Ill.—"Motor assembled correctly and performs perfectly. I am fully satisfied."

THE G. H. Q. GAS ENGINE CAN BE USED IN BOATS, MIDGET CARS & PLANES WITHOUT ANY CHANGES

The G.H.Q. Gas Engine sold six years ago for $35. Over 7000 were sold at $8.50. Today, you can secure a vastly improved engine kit for only $4.95 or $5.95 or factory-assembled for only $6.95. How is this possible? Simply because we have invested thousands of dollars in tools, jigs, dies and equipment to produce the only mass-production motor in the market. All parts are uniformly perfect.

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This identical G.H.Q. Gasoline Engine Kit is also available in factory assembled, fully bench tested and ready-to-run form.

This comes to you already tuned up . . . ready to mount and run, complete with coil, condenser & wires.

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FOR PLANE AUTO BOAT

OK Engines

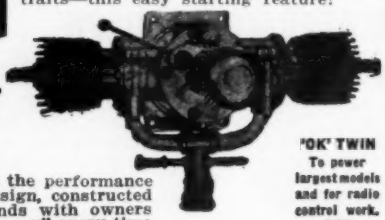
START EASILY — RUN CONSISTENTLY

A Snap to Start!

A distinguishing "family" characteristic—true in all 'O.K.' engines!—is this feature! Take a TWIN—take any 'O.K.' engine—flip 'er over once or twice and up she roars—singing as sweet a power throb as you'll ever enjoy! It's one of the outstanding family traits—this easy starting feature!

BOUQUETS to OK'S

Your 'O.K.' has the look, the feel, the performance of a champion! Sturdy, rugged design, constructed without skimping—it makes friends with owners and spectators. A "run for your money" every time—you'll never get shut out because of balky starting.



'OK' TWIN
To power largest models and for radio control work.
$40

MOST DEALERS STILL HAVE 'OK' ENGINES

Production adjustments necessarily adopted because of defense needs may have reduced dealers stock. If you are planning to own an easy starting 'O.K.' soon, we suggest you make your selection without too much delay!

If no dealer near you, write direct to the factory. Stamp brings you illustrated circular "EASY STARTING ENGINES" with diagrams, technical data, etc.

There's an 'O.K.' for AIRWAY-RACEWAY & MARINE

TWIN Displ. 1.208	$40.00
TORNADO Displ. .604	24.00
DELUXE Displ. .616	19.50
SPECIAL Displ. .604	15.50
'49' Displ. .493	15.50

MEMBER

HERKIMER TOOL and MODEL WORKS
[Dept. 10] Herkimer, N.Y.

oped an original gyroscopic flight trainer that responds to controls and performs many manoeuvers of a light plane. With propeller, control stick and a seat mounted on a base that can be swung through three planes, the trainer can be put through all the plane's manoeuvers, except a loop. With the gyroscope motor attached to the control stick and the pilot seat, the base is mounted on a large lead base, which is hemispheric in shape. In order that the student operating the trainer, and those watching him can understand the manoeuvers being attempted, a small projector is attached to the trainer. From the projector there is thrown on the screen in front of the trainer an image of a plane in flight, which gives a realistic picture of the manoeuvers being executed.

A model plane, in which controls are movable, demonstrating control operation of a light plane, has been developed by Don Coles of St. Paul. This model was so successful that one of the flight instructors at St. Paul used it with all his students. Don Coles, who this fall is starting his two-year studies with the United-Boeing School of Aeronautics as top winner in the Air Youth national scholarship contest, put the model to practical use by exchanging it for his own flight time.

Now only seventeen years old, Don already has his student pilot's rating, and will be ready for his private pilot's rating as soon as he is 18.

This shows how model training helps an aviation career.

Texas Starts State Campaign

The first state-wide campaign to make model airplane activities a part of every school program will get under way this fall in Texas, under the sponsorship of the H. R. Cullen Fund of Air Youth. Houston, Dallas and San Antonio groups are already active. Local committees have been formed and plans laid for active club programs. Kiwanis, Rotary and Exchange clubs are acting as sponsors of some groups. The University of Texas, and Texas A & M College have also named faculty committees to aid in furthering the plans.

Ed Burgdorf, known as the "pappy" of model building throughout Texas, is playing a leading part in "spreading the gospel" through the state. Art Vhay will also be on the job, working with new groups and acting as "circulating missionary."

Flash News

(Continued from page 33)

time. Told over his fifth cup of coffee was this story by Knudsen: "The United States' position in this world today reminds me of the story of the painter who was working in an insane asylum. One of the patients came along and looked up at the painter who was working on the ceiling. 'How ya' doin'?' he asked. 'Swell!' replied the painter. 'Then hang on to the brush,' the patient warned with a smile, 'I'm going to take the ladder away!' And the funny part of it is the aviation industry has held on to the brush!" Knudsen laughed. He's the most amazing character "Flash News" has met in recent months—and the most confidence-inspiring!

"I christen thee Vengeance—newest V in Britain's campaign for victory." So saying, Lady Halifax, wife of the British Ambassador, launched the new Vultee Model 72 Dive-bomber, the first of an order for 500 to be built for the Royal Air Force. Only the first two will be built at the Downey plant, the remainder by the Northrop Aircraft Company of Hawthorne, California, and by the Nashville Division of Vultee. The ship features an entirely new planform-design wing in that there is a pronounced sweepback in the inner wing panel leading edge and none whatever in the outer panel. In addition there is dihedral in the outer panel, giving the ship a somewhat bat-like appearance in the air. It is a huge ship, however, and is believed to have a greater bomb load than any other single engine military airplane.

A Grumman F3F-1 Navy fighting plane enroute from Wright Field to San Diego crashed and burned near Sacaton, Arizona, killing the pilot, assistant machinists mate J. E. A. Wedder, second class. We didn't know that assistant machinists mate second class were allowed to pilot navy airplanes.

Pay increases are on the way for aircraft workers with a minimum of 60c per hour for starting men and a blanket increase of 10c per hour for men above 75c an hour, the wage set for beginners after the first three months period. All increases will be made retroactive to July 1 pending government approval. This is necessary because of the "cost plus fixed fee" business most national defense orders are working on. Thus the increase costs the manufacturer nothing: only the tax payers—you and I!

Vultee is employing women workers on the assembly line due to shortage of skilled man labor in Southern California. More and more women are entering the sub-assembly departments of the aircraft factories, and in industries other than aviation. Men bank tellers, we know, are rapidly being replaced by the "weaker sex."

Colonel Robert Olds, the Flying Fortress expert, is rapidly expanding his Ferry Command and states that 66⅔ of our aircraft production is going to the Royal Air Force. He plans a command of 600 bomber crews for the trans-continental ferrying job which is adequate, he believes, for the job of handling the 50,000 planes ordered.

Italy is not building any military airplanes! She is building only small subassemblies for German planes, her entire (and immense) aviation industry being controlled by Hitler.

Strike-bound is Air Associates' Bendix, New Jersey, plant for C. I. O. demands for higher wages. Vital to defense is their production of parachutes, de-icers, propeller sleeves, and a host of various accessories.

That the shortage of skilled aircraft labor is dangerously acute is putting it mildly. Now the Navy and the Army air fields are advertising in local papers for

PLANE TALK

SKYWAY

SAVINGS ON ALL SUPPLIES

SPECIAL!
WINNER at 1941 NATIONALS!
BAY RIDGE—CLASS "C"
PACER! $4.95 p. p.
Immediate Delivery

18" BALSA STRIPS Select, Hard Stock

1/16 sq. 60. 5c
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3/16 sq. 8. 5c
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1/4x1/2 3 for 5c

18" Balsa Sheets
1/64x2 5 for 10c
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3/32x2 6 for 10c
1/8x2 .5 for 10c
3/16x2 3 for 9c
1/4x2 .3 for 10c
1/2x2 .2 for 11c
3" & 36" cost twice 18": 3x36. 4 times

NOSE BLOCKS
1x1x1 .1c
2x2x1 .2c
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3x3x3 .9c
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Sheets, 4 times 18". Double the above price for genuine aircraft SPRUCE

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1/8x1/2 .2 for 5c
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2x2 .1 for 16c
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Plastic Balsa
4 oz. 23c. 1 oz. 10c

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1/2 x 3/4 x 5 7—5c
1/2 x 3/4 x 6 6—5c
5/8x 1x 8 3—5c
3/4x1 1/4x10 2—5c
3/4x1 1/4x12 3c ea.
1x1 1/2x12 5c ea.
1x1 1/2x15 6c ea.

Plywood—1/16 1/8, 3/16, 1/4 40c ft.

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No Premiums or Packing
Charges on Motors—P.P. 15c

Ohlsson "19"	$14.50
Ohlsson "23"	16.50
Ohlsson "60"	21.50
New Ohlsson "60 Special"	18.50
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Big Allowance for Old Motors!

CEMENT
CLEAR DOPE THINNER
Banana Oil
1 oz. 5c. 1/2 pt. 30c
2 oz. 9c, pint 50c
Colored Dope
1 oz. 6c. 2 oz. 11c
1/2 pt. 35c. pt. 60c
MICROFILM
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LIQUID CELLULOID
1 oz. 9c 2 oz. 15c

G. M. SILKSPAN
White, Red, Yellow, Orange, Blue
3 for 25c.—"OO" —3c per sheet.
Gas Model Silk
H'vy qual. 50c yd.
AA TISSUE
All col.. doz. 19c
Silver, ea..... 4c
Supershk. wh. 5c
Bamboo Paper
White 5c. 6 for 25c
Colors, 2 for 15c

Trexler Wheels
1 1/4, 1 1/2—40c
1 3/4, 2—50c
2 1/4, 2 1/2—60c
Gas Mod. 2 3/4—$1
3-1.25—3 1/2-1.50
4 1/2-1.75

M&M WHEELS
1 1/4, 1 1/2, 1 3/4-50c
1 3/4, 2, 2 1/2-60c
Gas. Mod. 2 1/2-90c
Flyweight 75c
New 3".....$1.00
3 1/4 1.50, 3 1/2 2.75
4 1/2 2.75—5" 4.00

PROPELLERS
Balsa Pauio Ritz Wins Gas
5" 4c- 7c Mod.
6" 5c- 9c 8" 25c
7" 6c-12c 9" 35c
8" 7c-15c 10" 35c
9" 8c-19c 11" 35c
10" 9c-23c 12" 35c
12" 10c-28c 13" 35c
14" 12c-40c 14" 35c
15" 15c-50c 15" 35c
16" 16c-X 16" 35c
18" 25c-95c 18" 50c
RITZ Gumwood
8"-9"-10"-11" 15c
12"-13"-14" .15c
15"-16" 25c

GAS MODEL ACCESSORIES
Champion Spark Plugs 3/8 or 1/4 50c
Condensers—Metal, 15c Smith.....25c
Plugs & Jacks, Set of 2-35c val. 25c
Midget Tip Jacks 25c val. 2—15c
Terminal Clips 5/8" 10c val. 4— 5c
Gas Funnel, Alum. strainer.....25c
Spaghetti Tubing 1/16" 3 ft.—10c
Toggle Switch 50c val.....25c
"3 to 1" SAE 70 oil—1/2 pt.....25c
12" High Tension Lead—Best....14c
Booster Leads—50c Val.....35c
Masking tape—1/4x36-instruc. card 5c
Alligator Clips—3c Solderless.... 10c
Kn'st Manifold—Keeps Ship Clean
Nickel plated 50c. Streamlined $1.00
Spark Plug Wrenches—any size....20c
Neoprene tubing 20c

RUBBER-POWERED ACCESSORIES
Model Knife, Surgical Steel Blade 10c
Model Pins 1/2 or 1" 100 for..... 5c
Sheet Celluloid 5x7 3c, 14x17....15c
Ball Bearing Washer 10c value.... 5c
Sandpaper, 12 sheets 5x5..... 5c
Lilliput Lights—for display model, 3 lamps, wired, instruction sheet. Per set..... 60c
Insignia 36—American, French, English, German, Squadron, in colors, gummed, per sheet..... 5c
Washers, pinhole, 1/8, 1/4, 2 doz. 3c
Prop Shafts, doz ass. 6c, large....10c
Nose Plugs for 5c, 1/2"—3, 3/4"—6, 1" 4.

VOIT WHEELS
3 1/2 1.50, 4 1/2 1.75
Race Car Set 6.00
Ball Bearing 8.00

COILS
Smith 3 V...$2.50
Competitor ..$1.75
Superlite $1.75
Powerhouse $1.50
Aero-Coil $2.25
Blue Flash..$1.00
U.S. Coil...$1.00

Wing & Tail Lts.
(3 in a set)
5/16, 8c 9/16 10c
11/16 12c per set

TIMERS
Austin $1.25
Dural 1.95

DURAL ANGLE
1/2x1/2 .....20c ft.
3/4x3/4.....30c ft.

Bona Fide Dealers Write for WHOLESALE PRICE LIST

ALUM. TUB'G per ft.	BRASS TUB'G per ft.
1/16.....8c...10c	
3/32, 1/8...10c...15c	
3/16, 1/4...15c...18c	

Sheet Alum—ft.
.003 25c .010 35c

MUSIC WIRE
.014 .....6 ft. 2c
.020 .028 6 ft. 3c
.034 .040 6 ft. 6c
.049 .....6 ft. 8c
1/16" .....3 ft. 5c
3/32" .....5 ft. 15c
1/8" .....5 ft. 20c

BROWN RUB'R
1/16 sq. 15 ft. 5c
1/8 flat 15 ft. 5c
3/16 flat 12 ft. 5c
Skein 225 ft.
1/16 50c. 1/8—60c, 3/16—85c

Camel H'r Brush
Med. 8c, Lge. 8c
Small 3c, Gas Mod. 15c

Thrust Bearings
1/4 doz. Sm. 5c
1/8 doz. Lge. 7c

Celluloid Radial ENGINES
1 1/16" 8c, 2" 12c
2 1/2" 14c, 3" 17c
4" 50c, 4 1/2" 65c

MACHINE GUNS
3/4" 2c, 1 1/4" 4c
1 1/4" Lewis.... 5c
1 3/4" Lewis.... 6c
1 1/4" Ring Mt. 10c
1 3/4" Ring Mt. 15c

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mechanics, electricians, welders, instrument men, etc., to work on a salaried basis at repair depots and regular squadron bases.

According to the Aeronautical Chamber of Commerce, aircraft production for the first six months of this year was 7423 planes, over one thousand MORE than ALL of last year. And we're only HALF-WAY through 1941!

Army battleships? Yessir! That's the plans now, to construct four battleships at a cost of one million dollars each to use as target ships for high altitude Army bombers to go to work on. Two of the ships will be stationed in the Atlantic and two in the Pacific and each ship will have a crew of between 30 and 40 men. The decks will be heavily armor plated to withstand the 1,260,000 ft.-lb. striking force of the sand-filled practice bombs of the Army dropped from 27,000 feet and higher. The crew, needless to say, will be securely housed in below-below-below deck quarters operating the ship at wartime speeds and courses. The Air Corps has wanted such target ships ever since General Billy Mitchell acquired a number of old German battleships for practice back in 1921.

L. M. Giannini, President of the Bank of America, states that his firm has been making loans for lightplanes on exactly the same terms and conditions as the firm's huge automobile financing business for the past six months and has found it to be satisfactory in all details. More than one million dollars in contracts have been written so far for the purchase of both new and used planes, which presages a nation-wide trend.

First four DC-4 fuselages have come out of the jigs at Doug as' huge Santa Monica plant and the wings are soon to be fitted, thus spiking rumors that the huge four-motored airliner had been shelved.

The Air Training Corps, a pre-entry training program for the Royal Air Force, has been formed and 190,000 youths between the ages of 16 and 18 have been enrolled, according to J. F. Wolfenden, director.

The Netherland East Indies Air Force has recently received two full squadrons of Consolidated Catalina (PBY-type) flying boats from the Royal Air Force to strengthen Dutch defenses in that vital area.

It was recently revealed that more than 30,000 changes were made in the Lockheed P-38 before the first production plane was recently test flown. This including lightening the structure 1300 pounds and re-designing the wing center section to provide for integral fuel tanks.

For the first time, it is believed, an aircraft factory has borrowed men in addition to tools for a job. Northrop Aircraft recently borrowed eight Vultee research engineers for work on a special project for the Army Air Corps.

Falcons (the real bird kind) are now being trained by the Army's Signal Corps to attack enemy carrier pigeons and parachute troops it was recently disclosed. The huge birds, with large knives strapped to their talons, will attack any invading parachute army and either cut the shrouds or badly wound the enemy soldier.

The Firestone Tire and Rubber Company has formed the Firestone Aviation Corporation, a wholly-owned subsidiary to handle the firm's growing business in aviation development, engineering, pro-

BIG MONEY BUILDING MEAD'S
NEW Portable OUTBOARD BOAT!

Mead's New OK-2

Build this light, 50 lb. tough, durable, seaworthy, **portable Outboard KI-YAK!** Take it anywhere by hand or car. Safe, dependable, trouble-free. More speed per horsepower, more miles per gallon. MEAD'S perfected METAL-ribbed, cut-to-fit Construction Kit guarantees successful assembly, quickly, easily, economically. New 75 lb. OK-4 uses oars, sail, motors 9 h.p. or less. Also 3 "CK" paddle—sail models from 20 lbs. to 45 lbs. Finished double-blade Paddle or Oars now INCLUDED with your KI-YAK! Write for FREE illustrated circular, low Factory-To-You prices!

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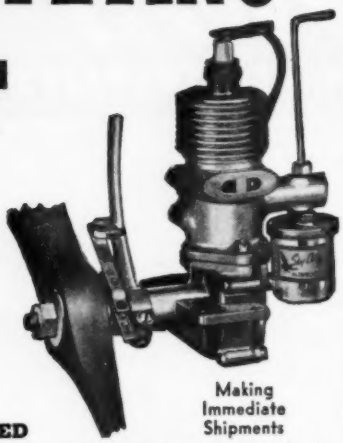

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*Sky Chief "Lightning" 3 ounce Coil
*Bore ⅞", stroke ⅞", displacement .526
*R. P. M. up to 13,000 with 13" propeller.
*All bearings are Diamond-bored and Micro-lapped
*Weighs approximately 10 ounces with coil and condenser
*Multiple-finned Cylinder made of Molybdenum Iron
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duction and distribution.

Northrop Aircraft, Inc., now has a backlog of $47,325,237 the bulk of which is for spare parts and sub-assemblies for Boeing and Consolidated bombers and patrol-bombers respectively. Also under preliminary planning is a new Air Corps project of a highly confidential nature.

He's Cadet Victor N. Looney to the officers and men of the Air Corps training base at Randolph Field but he is known to his native Indian tribesmen as Notahawa and is a full fledged chief.

Here are a few of the items Chrysler is producing: 28-ton 8-gun tanks, Bofors 40 mm anti-aircraft guns, nose and center section for Martin B-26 attack-bombers, airplane bomb fuses, and army trucks. In addition they have just completed design work on a new 2,000 horsepower aircraft engine and production is due to get under way shortly.

All available eligible reserve Air Corps officers have now been called into active duty and are now seeing service with tactical squadrons.

While the regular Army is getting one-ounce blocks of fudge-candy scientifically prepared with the right number of calories and vitamins to give the infantry needed energy, the parachute troops are now receiving four-ounce blocks of the same preparation. It might be four times as tough on the nerves, but floating through the air could never be worse than marching along on aching Number 12's.

Lockheed Aircraft Corporation has set an all-time aircraft production record by delivering $45,871,509 worth of military airplanes in the first five months of 1941, biggest in aviation history. Also set was a hiring record of 3,959 new men in the single month of May.

Most peculiar yet tragic accident of the month occurred when La Verne Grover, engineer for the Derrey Parachute Company of Los Angeles, went aloft to test a new design parachute. As he reached out to release the dummy to which the parachute was attached, his safety belt failed and he tumbled out into space and to his death. The dummy landed safely.

Gregory Augustus Daymond, only 20 years old, has been credited with shooting down the first bomber accredited to the newly formed and highly publicised American Eagle Squadron. Daymond bagged a fast Dornier Do-17 twin-engined bomber while on a coastal patrol mission over the English Channel. This was the sixth plane claimed by the squadron, the others being enemy fighters, and the third destroyed by Daymond. Not bad for just twenty years of age!

What was once a tragic gag has now become an oft-repeated truth for Floyd Marvin Sipple, attached to the Headquarters Squadron of the 35th Pursuit Squadron at Hamilton Field, lost his life recently when he was run down by an automobile while on leave in Carson City, Nevada.

Easily the most heavily armed plane in the air today is the recently improved Bristol Beaufort twin-engine convoy bomber which mounts FOUR cannon in the fuselage and six machine-guns in the wing. It has a top speed of 330 miles per hour at 14,000 feet with a load of 7,200 pounds.

Mission, Texas, a stone's throw from the Mexican Border, has been selected as the site for a new four million dollar Air Corps advanced flying school. It will accommodate 2,400 officers and men when in full operation.

Twenty youths stationed at the Naval Reserve Base at Pennsauken, New Jersey, got sick and tired of watching the other guys flitting about in Naval training planes while they stood idly by taking care of the field and the hangars. Thus thinking they pooled their meager resources and bought a lightplane. Now they're teaching themselves to fly so that when they come of age and enter regular Navy flight training they'll breeze right through the course.

Few actually documented stories of American planes in World War II have reached America and it has become an ever-growing mystery as to just what happens to our planes when they arrive in England. However, one substantiated story has reached our desk of a squadron of Curtiss' (P-40) Tomohawks which were shipped from London down to the campaign in Syria in North Africa. The first day out the 10 Tomohawks met 30 Messerschmitt 109 single-seat fighters. They whaled into the Nazis, knocked four of them down, damaged several more and returned to their base unharmed.

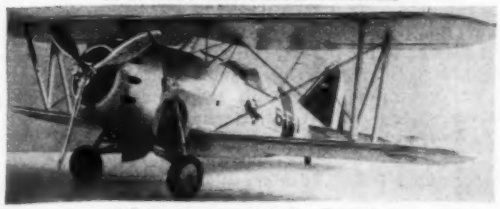
The air is no longer free, not by a long shot! So says the joint military-commercial board for air regulations which recently decreed that the air below 3,500 feet is free for private pilots, from 3,500 to 17,000 for airlines and private planes equipped with transmitter and receivers, and the air above 17,000 feet is reserved strictly for military flying.

Air line officials are beginning to get worried about the new super-speed airliners they are to get next year. Present transcontinental routes provide for a leisurely over-night sleep for the business man enroute East or West. If new speedliners cut flying time too much the businessman's (and woman's) slumber will be cut short, perhaps too short for comfort. Even now airliners with top speeds of 230 mph (present DC-3 equipment) make the trip throttled to about 180 for passenger comfort.

What's the advantage? Harvey Christen is Lockheed's assistant works manager. Since 1933 he has been planning an extra-super vacation with his wife and family far away from it all. Just as everything was set, Lockheed dumped the P-38 in his lap and he's been working 10 hours per day seven days a week for the past two years. We'll bet there's more than a few others just like him.

This is a kid's war! Among the leading aces of the three major air powers involved, the average age is . . . hold your breath . . . 27 years old! Squadron Leader Michael Crossley, top man in the R. A. F. last Fall with 22 Nazis to his credit, recently arrived in Southern California to put new models (Lockheed Ventura, Vultee Vengeance, North American Mustang) through their try-out paces, is

GRUMMAN F3F1
U. S. NAVY SHIPBOARD FIGHTER



32" Span. Length 24". 1" Scale

A fine detailed model with retractable landing gear, 4" turned balsa motor front, 3 oz. grey dope, ½ oz. yellow, 2 oz. glue, etc. All parts printed on balsa, 10" propeller, Wheels, rubber motor, full size drawing, and all parts. This fighter plane is used in large numbers on the aircraft carriers. Const. Set complete, postpaid. **$3.75**

CURTISS HAWK F11C4 PURSUIT NAVY

32½" Span. Length 22¾". 1" Scale. Weight 6 oz. Color grey, top wing yellow

THE MOST EXCLUSIVE AND FINEST EQUIPPED MODEL IN THE WORLD. MOVEABLE CONTROLS WORK FROM COCKPIT. A special de luxe model, one of the most beautiful ever made. Set contains a 4½" scale Wright Cyclone celluloid motor, detailed push rods, fins, etc., like real motor, 4½" aluminum cowl, 10" steel type carved prop shown, 2¾" wheels, tail wheel, star and rudder insignia and lettering, rubber, windshield, instrument board, flying wires, 4 aluminum step plates, aluminum wing walks, ready cut wheel pants, washers, 3 oz. grey paint, ½ oz. yellow, ½ oz. red, 2 oz. glue, etc. All other parts are printed on balsa wood 33"x44" scale drawing. Const. set, complete in labeled box, postpaid..... **$4.50**

NEW TAYLORCRAFT SPORTPLANE

36" Span. Length 22". 1" Scale. Weight 2 oz.

COMBINATION LAND AND SEAPLANE SET

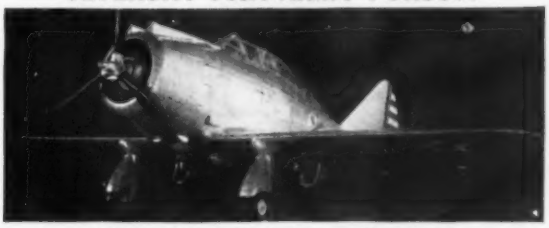
A beautiful exact scale flying model with unusual flying range, so light it will rise from land or water in 6 feet. Const. set contains all parts printed on balsa, carved propeller, hardwood wheels, 2 oz. white dope, ½ oz. black, glue, full size scale drawing, all parts to build, and parts to make floats. Set p.p..... **$1.50**

9-FOOT 1941 TAYLORCRAFT GAS MODEL

9 Foot Span. Length 66". 3" scale
MODEL ¼ SIZE OF REAL PLANE. CAN USE RADIO CONTROL

One of the easiest gas models to build. Has special wing airfoil for slow landings. Set has ready cut wing ribs, gear struts, nose piece, etc., set of paints, dope, glue, etc. Model weighs 3¾ lbs without motor, suitable for radio control. Lifts 4 lbs. additional weight. Full size drawing. Const. set, postpaid, less wheels and motor.... **$15.00**

SEVERSKY P35A ARMY PURSUIT



32" Span. Length 25". 1" Scale. Color, Silver

Set has 4" turned balsa motor front, 10" carved prop, balsa wheels, tail wheel, rubber, all parts printed on balsa, 3 oz. silver dope, ½ oz. black, 2 oz. glue, etc., insignia, and full size scale drawing. New improved model has retractable landing gear and movable controls from cockpit. Set, postpaid..... **$3.25**

TAYLOR CRAFT MODEL WITH FLOATS ON

CURTISS SO3C1 NAVY SCOUT

30" Span. Length 27". Color, Silver and Yellow

An exact scale model of the latest Navy Scout. Carved propeller, insignia, wheels, rubber, etc. Const. set has all parts printed on balsa, silver, yellow, and black paint, glue, prop, full size drawing, and all parts.
Set, postpaid..... **$3.00**

GRUMMAN F5F1 FIGHTER

24" Span. Length 17". Weight 3 oz.

Const. set has all parts printed on balsa, balsa motor fronts, carved 7" props, grey and yellow dope, glue, full size drawings, and all parts.
Const. set, postpaid..... **$2.95**

BOEING B-17 FLYING FORTRESS

44" Span. Length 30". Color, silver

Set has all parts printed on balsa, four 2" turned balsa motor fronts, four 4" carved props, celluloid wheels, set of paints, glue, and full size drawing.
Set, postpaid..... **$4.50**

De luxe set with 4 aluminum cowls, 4 celluloid motors, 4 metal props, and 2 M & M air wheels.
Set, postpaid..... **$6.25**

CURTISS F11C4 SOLID MODEL

10½" Span. Length 7½"

This is a special de luxe solid model. Set has completely finished balsa fuselage, cockpit cut out, routed pants, wings cut to shape, 1⅛" de luxe cast motor, alum. cowl, 3 bladed cast prop, paints, drawing and all parts. Set p.p..... **$1.50**

CURTISS P36 ARMY PURSUIT

37" Span. 1" Scale. Color, silver

Set has turned motor front, set of paints, glue, all parts printed on balsa, and full size drawing.
Set, postpaid..... **$3.25**

BOEING P26A ARMY PURSUIT

22" Span. Length 17⅛". ¾" Scale

Set has all parts printed on balsa, 3" celluloid motor, 3¼" tapered aluminum cowl, set of colored paints, scale drawing, and all parts.
Set, postpaid..... **$2.75**

NORTHROP A-17 ARMY FIGHTER

24" Span. Length 16½". ½" Scale

Set has 7" prop, turned motor front, wooden wheels, complete set of paints, all parts printed on balsa, scale drawing, insignia, and all parts.
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RYAN STM-2
MESSERSCHMITT
CURTISS HAWK
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GRUMMAN F3F-2
HURRICANE
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SEAPLANE NAVY TRAINER
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SYNCRO WORLD'S SAFEST **SAWS**

SYNCRO DEVICES, INC. 3265 Bermuda, Dept. MA-101 Ferndale-Detroit, Michigan

now just 28. He started his career in the R.A.F. when only 23! Nazi bomber crews have been downed in Britain with some members 16 and 18 years of age. One Messerschmitt fighter pilot captured after being painfully wounded admitted he was only 14 . . . had lied about his age to the Luftwaffe! Watch the newsreels . . . you'll see the kids that are doing the dirty work and the fatheads that are telling what, when and how to do it . . . all past fifty!

Wright Aeronautical Corporation's June output was 1,170,000 horsepower, and all-time high in American aircraft engine production.

North American has been awarded a contract for $6,325,650 for B-25 bombers and spare parts. The new Kansas City Plant (when and if) will handle the order.

Douglas B-19 has made seven flights to date, now handles like a bird, states Major Stanley Umstead, who has been at the controls of all of them. The ship has been taking on added weight each trip, will soon struggle aloft with its full load of 82 TONS! The jigs have been destroyed, the drawings carted off to Wright Field for vault storage, so there'll be no other for several years to come at least. But Martin states they have one in the assemble stage now that is half again as big!

Only a year ago we were telling you about airline record-breaking for passenger-carrying and miles flown. That, too, will not be repeated for some time to come as flights are being cut and thus volume dropping off due to military demands for used equipment from the airlines. American has discontinued one of its daily flights between Boston and Chicago to give up two more precious DC-3's to Britain. Ninety-one planes have been sacrificed so far and 24 more are requested. We now have only 358 ships servicing our entire nation.

New Navy bases in the growing chain: huge stations at Johnston and Palmyra Islands. Midway Naval Air Station will have been dedicated as you read this. Thus did Rear Admiral F. J. Horn, of the Navy General Staff, back up his statements that: "We are preparing for any eventuality. We know this—make no mistake about it—the Navy will be ready in the Pacific." Diplomatically avoiding calling Japan by name, he said in a few words what we all want to know. May we raise a very, very small voice among the clamor and say: Japan—look out! If you're looking for it—you'll get it, and then it will be too late to regret!

Dramatic to us, routine to them, is the story of the mid-Pacific rescue of two stricken submarine crew-members, M. L. Herstigh, torpedoman second class, and W. M. Devling, fireman second class, by a huge PBY patrol-bombers which flew from San Diago Naval Air Station, landed alongside the submarine and returned to the Naval Hospital in time to insure adequate medical treatment.

We've seen Hollywood Theaters open with a huge premier accompanied by a group of parading pickets on the opening night but Consolidated had picket trouble recently at its new Fort Worth plant before construction was even started when 12 carpenters went on strike for higher wages. The carpenters were employed to lay foundation concrete moulds. And this all happened 24 hours after Bill Knudsen had asked that every effort be made to complete the plant and get bombers into production on the sight as soon as possible.

New Doak plastic-bonded training plane has just been completed. Powered by 225 hp Continental engine and is for the C.A.A. trade. Company is now doing $224,500 worth of sub-contracting for parts and sub-assemblies.

During military maneuvers last summer a veteran Air Corps observer took an officer of the field artillery aloft on a reconnaissance flight to locate "enemy" guns. The Air Corps officers spotted only a few of the guns, the artilleryman all of them. Chagrined at this performance, the Air Corps veteran investigated and was startled to learn the artilleryman was color blind!

Other color-blind observers were sent up and they in turn located the guns with little difficulty. On the trail of something hot, the Air Corps officer discovered that to the normal, color-conscious person the green-painted canvas used to conceal the artillery was undistinguishable from the surrounding grass fields but the color-blind person records only the difference in the light reflection and thus spotted the guns. For years the Air Corps has rejected color-blind men for flight training, but now is hastily and some-

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KEEP IN STEP WITH MODERN AVIATION—BUILD METAL COVERED MODELS

Announcing the addition of three new models, The Grumman F4F-3, Spartan "Executive," and Republic Guardsman.

Actual photograph of Grumman F4F-3 Model.

It is easy and fascinating to build real planes in miniature with sheet aluminum covering. Imagine these models, completely covered with aluminum even to reproducing the rivets in the actual planes. The photograph will give you an idea of how the finished model will look.

The kits contain all balsa parts cut to outline shape, die-cast propellers, rubber military type wheels, aluminum tubing for landing gear, celluloid windows, finest supply detail plans, aluminum sections ready to assemble. Nothing missing to build a real plane in miniature, with the exception of liquids.

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10"	Bell P39 Airacobra	.75
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what timidly scouring its files to muster all the rejected color-blind men back into service as artillery spotters!

New Douglas now in the Project Room is a super-super re-design job on the basic DB-7 model, this time with 20% more speed, 200% more armament, 100% more horsepower than the standard R.A.F. "Boston" model. But the British won't get this one, at least not for sometime, because the Army Air Corps wants to keep it strictly for the good old U.S.A.

Consolidated recently started in on $226,636,200 worth of B-24 four-motored long-range heavy bombers of an advanced design. Consolidated is now the largest privately owned aircraft factory in the U.S. running neck and neck, however, with Lockheed. Douglas will soon regain the lead, it is announced, with the completion of its Tulsa and Long Beach Divisions with a total of 80,000 by next summer!

Production mix-up following the exact pattern of pre-war France and which led to its sudden downfall, is now under way in U.S.A. Boeing is building DB-7 Douglas attack-bombers; Douglas, and Vega will soon build Boeing B-17's and Douglas is also going to build Consolidated B-24's in its Tulsa plant. Look out, America, this exact thing ruined the Air Force and thus murdered the ground troops of a very efficient national defense in France. Don't let it happen here! Let Boeing build Boeing, Douglas Douglasses and Consolidated Consolidateds with a share (not too large) of sub-assembly work let out.

In order to jell the hue-and-cry into a production program, the National Association of Sailplane Manufacturers has been organized by Bowlus, Brieglieb, Schweizer and Frankfort to develop and produce a military troop transporting glider for use in trains.

THE INDUSTRY'S PROBLEM: Jim Jones graduated from high school two years ago, worked at the corner drug store for nearly a year, got a steady job with an oil company, then heard about the local aircraft manufacturer. He was taken on, put on the assembly line. He started at 50c an hour, now gets 72½ plus 10 hours a week of overtime. Three months ago he asked his girl that question and now they're living in a brand new F.H.A. home in a new housing section only a mile from the airport. Helen, that's his wife, is expecting a baby. They've got a brand new Ford V-8, a console radio, a new washing machine, he—two new suits, she—three new dresses, four pairs of shoes and two new hats. ALL OF THIS ON THE GOOD OLD AMERICAN INSTALLMENT PLAN! Six months go by and the baby comes. Dr. Smith asked $50 cash and agreed to take the other $150 in installment. Well, Jim got a new basinette and baby clothes. Helen is still taking the baby to the doctor twice a month for a check-over and he's on his regular formula. Doctor and drug store bills have been provided for on the installment plan. Jim doesn't know it but he's walking right into the most vicious, uncompromising trap there is in existence: debt. He's got into the habit of

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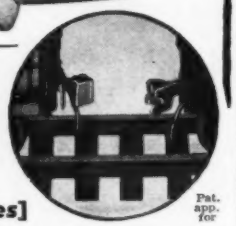
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stalling the collectors off, seeing a corner show twice a week, even a little dancing on Saturday night. He's making around forty bucks a week, is signed up for exactly forty bucks a week in various payments. He's meeting about half those payments, letting the others slide, taking on new payments regularly (record-player and records, vacuum cleaner, a desk and chair for the bedroom). Now, suddenly, he reads about the end of the War, 400 of his pals go one week, 1200 the next week, then he and 2199 buddies are let out the following week. Jim is done for. There's no possible solution to his miseries. He loses everything he owns. The entire world has crumbled when Helen goes back home. And there's two hundred thousand Jim Joneses in the U.S.A. Take a lesson Jim Jones from this mythical story: take it easy, wait, observe, learn, save, plan, think, think, and think some more. Remember there's lotta more tomorrows than there are yesterdays or todays in your life!

Employment figures: Lockheed now has 25,887 men employed, Consolidated, 16,500; North American, 10,579; and Northrop, 2500 men now working.

Lockheed has three new interceptor and bomber experimental projects now on the design board, an improved model of the P-38 Interceptor which will far exceed any plane now being constructed anywhere in the world.

A large number of Curtiss Tomahawk fighters (Air Corps P-40 models) are now in action in the vicinity of Tripoli, the Royal Air Force announces.

Arthur J. Brandt has resigned as chief of manufacturing unit of the aircraft section of the Office of Production Management, due to poor health and the strain of work.

Lynn Berkenkamp and Usher Rousch, American pilots of Taca (Central American Airline) have been missing for more than three weeks on a flight from Cabexas to Alamicambra in Nicaragua.

Model Designing Simplified

(Continued from page 23)

should equal 7. Therefore $S^2 = 7(448)$, or $S = 56$ in. Then Chord $C = 56/7 = 8$ inches.

Summarizing:—A plane powered with a 2.9 cu. in. engine should have a span of 56 in., a chord of 8 in. and a weight of 23.2 oz. or more. To allow for possible wing area variation, weight should be 24 oz. This is the smallest and lightest plane that can be constructed according to contest rules, with a 2.9 cu. in. engine.

By the same procedure, the lightest and smallest plane using a 1.9 (class A) engine is one with a 44.75 in. span, 6.4 in. chord, a total wing area of 274 sq. in. and a minimum weight of 15.2 oz.; allowing for variation, 16 oz.

Such planes however are very fast and powerful for their weight and size, making them unsuitable for beginners. Consequently it is advisable to equip each with a motor of less power than specified.

In choosing the size of your model the one with 56 in. span is neither too large nor too small, and will be selected as the model to design. By using a motor of 23 cu. in. displacement (class B) or one of 1.9 cu. in.,

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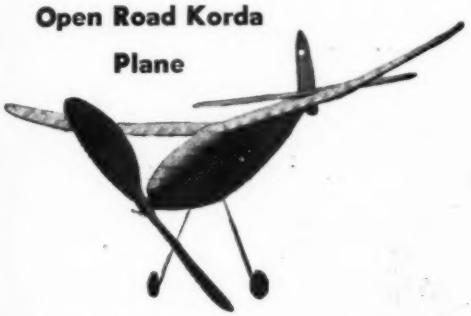

On its first flight this plane flew for more than an hour. Has 34" wingspan, made by Berkeley and designed especially for The Open Road by the famous Dick Korda, winner of the 1939 Wakefield Trophy. Wooden parts printed out, propeller parts ready made; also landing gear, propeller shaft, and rubber tensioner. Complete kit except for liquids and rubber motor which you can get at any dealer's.

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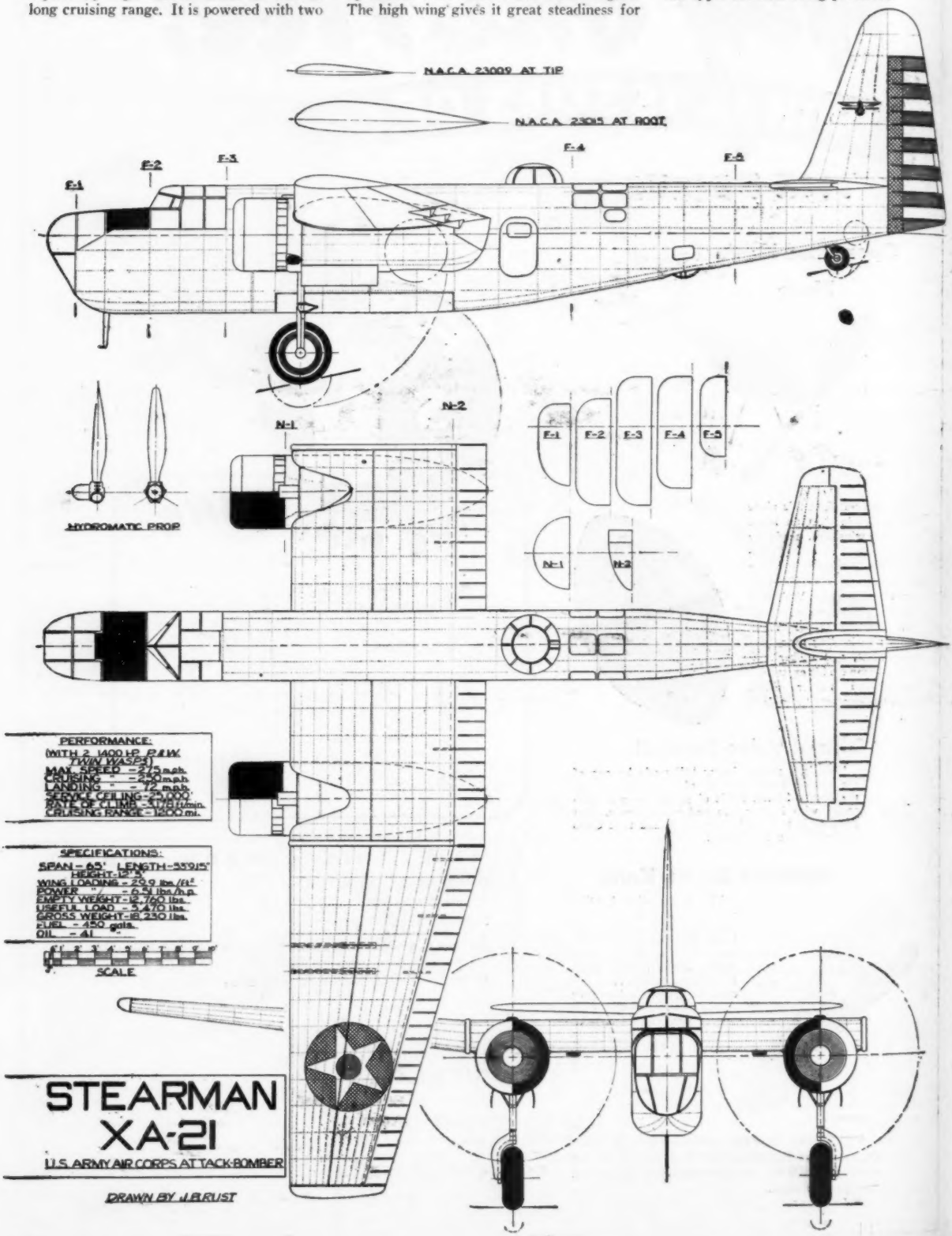

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sufficient power will be available for fine performance yet the speed will not be great enough to make adjustments critical. Such a model will make an excellent practice plane.

Now that the size of the model is established the next step in design is to lay out the basic force arrangement by applying a few simple rules. This determines the general proportions of the model: insuring stability and flight efficiency.

Make the preliminary force layout on a piece of smooth stiff cardboard, about 20 in. long and 10 in. high, from which a side view pattern of the plane will be cut when the layout is completed (as shown in fig. 1) and the outline of the plane drawn in. The layout is to be drawn half the actual size of the plane, so all measurements will be half size.

Start by drawing in the thrust line horizontally on the center of the cardboard. Then draw a vertical line intersecting the thrust line about 7 in. from the left side of the cardboard, representing the center line of the wing. The wing chord C is to be 1/7 the span S or 8 in. (—4 in.) on the layout. The tail moment area M should be three times the chord so the centerline of the tail surfaces lines 12 in. to the right of the wing centerline. Draw this on the layout intersecting the thrust line. Make the nose length (N) 1/3 the moment arm, 4 in. on the layout, so draw a vertical line 4 in. to the *left* of the wing centerline; see fig. 1. In fig. 2 a typical gas model is shown with N, M, and symbols of other model proportions indicated. Insert the symbols for the various distances in the layout as you proceed. Measurements of the other distances are as follows:

Distance (G) from line of thrust (L.T.) to center of gravity (C.G.) = —0.04(M) = —0.96″; 0.48″ *below* thrust line, on the layout wing centerline. L, from L.T. to center of lift (C.L.) = 0.19(M) = 4.56″, or 2.28″ above T.L. on layout wing centerline.

U, from C.G. to center of lateral area (C.L.A.) = 0.1(S) = 5.6, or 2.8″ to rear of C.G. on a horizontal line through C.G. This distance is approximate, being determined finally by the fin area.

W, distance of wheel axle from vertical line through propeller bearings, = N/3 = 2.67″, or 1.34″ on layout.

Q, from L.T. to ground line (lower edge of wheels), = 0.4(M) = 8.4″, or 4.2 in. on layout.

B_L, distance from thrust line L.T. to lower body contour = 0.187 × (M) = 4.5 in. or 2.25 on layout. B_U, from thrust line to upper body contour above C.G. = 0.042(M) = 1 in. or 1/2 in. on layout. F_L, the distance from L.T. to the lower edge of the fin should equal 0.187 (M) = 4-1/2 in. or 2.25 on layout. F_U, from L.T. to upper edge of fin = 0.146(M) = 3.5 in. or 1.75 on layout.

Other required design values are: fin area A_F should be 7% of the wing area A = 0.07(A) = 0.07(432) = 30.24 sq. in. Approximately 40% of the area should lie above and 60% below the thrust line: Stabilzer area = 0.3A = 0.3(432) = 144 sq. in. The stabilizer aspect ratio $\left(\frac{\text{Span}}{\text{Chord}}\right)$ should equal 3.5.

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Wing dihedral is determined by the distance the tips are raised above the wing center. Each tip should be raised 3/4 in. for every foot of span. As the span is 4.67 ft., the tip rise $T_R = 4.67(0.75) = 3.5$ inches; 1.75 in. on layout.

Wing angle of incidence = 3 degrees. This is equivalent to raising the leading edge 1/16 in. per degree above the trailing edge for every 4 in. of chord, or 3/8 in. total.

The stabilizer is to be set at 3.4 degree positive. However the amount to raise the leading edge cannot be determined until the stabilizer chord is known. The chord line can be drawn in by using a protractor to measure the 3/4 degree angle.

Now on the cardboard lay out positions of the thrust line, C.G., C.L.A., C.L. and other values given here. Your drawing then should appear similar to the heavy lines in fig. 1; this is the basic layout which establishes the proportions and aerodynamic values of your gas model.

Now it is necessary to lay in the outline of the wing, fuselage, fin, wheels and other parts appearing in a side view of the plane. Start by drawing in the upper contour of the fuselage. The maximum height of this line above the thrust line should be equal to 1 inch: 1/2 inch on your layout. Curve the forward part into the nose spinner; the rear part should sweep backward and gracefully downward to the point where the forward part of the fin intersects the thrust line.

Next draw in the lower body contour, curving it gracefully from the nose downward and back so its maximum distance from the line of thrust equals 4.5. From this point it bends rearward and upward at a gradual slope until it blends in with the dotted line indicating the forward portion of the fin surface. A typical outline is shown in fig. 1.

Draw in the general outline of the fin; its lowest point being a distance equal to 4.5" from the thrust line and its highest 3.5" from the thrust line. Blend the upper and lower body contour with the fin outline. The size of the fin will be only approximate.

The next step is to determine the area of the fin as outlined on the drawing; its area should be 7% of the wing area or 30.24 sq. in. This area may be determined by drawing parallel lines over its surface, forming one inch squares. Add up the squares and fractions to determine the exact area of the fin as you have outlined it. If it is too large take area away from the rear of the fin or make the curve of the fin at its upper and lower tips more abrupt. If it is too small add area to the rear or make the tip curves of greater radius. Repeat this until the fin area is exactly 30.24 sq. in.

Next draw in the wheels and add dotted lines to form struts connecting the wheels to the body. When the pattern is cut out this will serve as wheel supports.

Next locate the wing. This should be drawn around the center of lift, C.L. The tip rise T_R is to be 3.5 in.; the tips will be above the C.L., the center chord line below the C.L. Usually the C.L. is nearer the latter than the former, about 43% upward from the chord centerline. Therefore the center point of the chord centerline should be 1-1/2 in., 3/4 in. in the diagram, below the wing tips and the wing tips 2 in. above the C.L. Through the lower point draw the chord centerline at 3 degrees to the thrust line. Measure off the chord length 8 in. at this line, 4 in. (2" on layout) on each side of the vertical from C.L. Then draw in the outline of the wing as indicated in fig. 1. The wing should be connected to the fuselage by a wing pylon; this also is shown.

When you have completed all these operations the pattern should be cut out. Glue an extra piece of cardboard over the wing and wheels; this is required because there are two each of these and have double effect in respect to determining center of lateral area. Do not put a double thickness on the wing pylon or any other part of the plane.

When this is done balance the pattern on the point of a pin. When it remains motionless in a horizontal position puncture the pattern with the pin—this will be the center of lateral area of your airplane and will be located approximately at the point C.L.A. shown on the diagram. If it is more than 1/40th of the moment arm (M) above the C.L.A. more area should be added to the lower part of the fuselage, beneath the C.G., the lower body contour should include more area. This will help to lower the C.L.A. If it is below the C.L.A. it will be beneficial rather than harmful. The actual point may lie forward or to the rear of the approximate C.L.A. position on the diagram. This will not affect the plane. Mark the point of balance as the final C.L.A.

After the side view silhouette pattern is in final form a layout drawing may be made by tracing. On this draw in the C.L., C.G.,

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final C.L.A., thrust line, stabilizer chord line (3/4 degree to the thrust line and ½ in. below it), as well as other details of the plane. This will serve as basis for your final assembly drawing.

Next month we will show how to properly locate the aerodynamic factors for a scale gas model.

The Two Event Nationals Winner

(Continued from page 11)

When building wings or stabilizer watch closely for twists or warps, which can be avoided if the parts are pinned down properly when doping and left to thoroughly dry.

For the wing use a piece of 1/8" x 4" x 36" balsa. On this draw the outline. Measure off the width of the leading and trailing edge, drawing in the rear of the leading edge and front of the trailing edge. Join these lines with a curve at the tip, according to the drawing.

Next cut out the notches for the ribs and glue them in place. Ribs are cut from 1/16" medium hard balsa.

Let dry thoroughly, sand, apply tissue, spray. Apply one coat of nitrate dope; start at the bottom and then dope the top, one section at a time. When doping and drying, be sure the wing is firmly pinned down, as every effort must be taken to prevent warps. Also take special care when covering with tissue as wrinkles not only spoil the ship's looks, but its efficiency. We have found neatness always pays good dividends.

Make the spinner and propeller from a 2" balsa block, The spinner must be accurately carved; it should be turned on a wood lathe if possible, when you are sure it is the proper size and shape.

Carve the propeller, starting as shown in fig. 1, using a balsa block 7" x 2" x 1-1/2". Before carving insert a piece of 3/32" plywood in the block; this gives the hinge end strength. (Fig. 2) When dry carve the prop to shape as shown in fig. 1; then turn it to the front view shown in fig. 2; now carve the same as you would any other. Use a pop bottle when sanding the under camber, this gives a really smooth finish.

Apply four coats of cement and then several coats of clear dope. Next place two 3/32" bushings in the propeller hub, as shown in fig. 1, one on each side of the hub.

In assembling the propeller lay it along the fuselage side, in the proper position to fold, and place the spinner in its proper place. This will give you the proper angle to cut the slot in the spinner which will hold the prop.

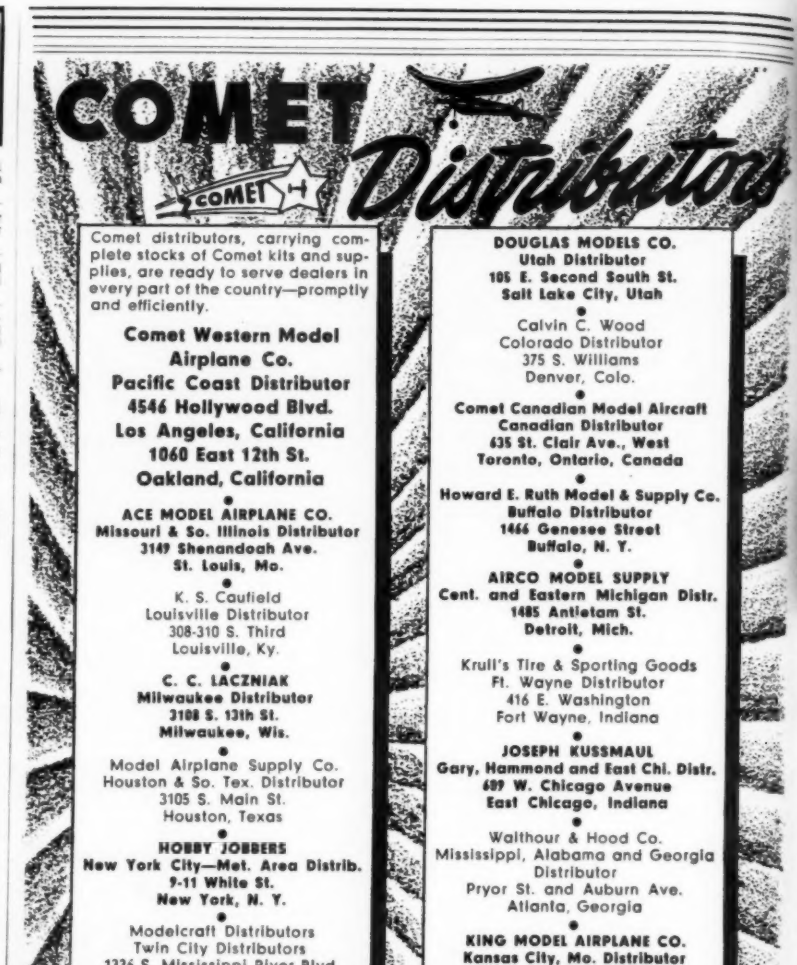
Using the following procedure, this prop is held in place with a piece of .04 piano wire: Place the propeller in the slot and run the wire through the spinner and propeller. Using the wire as a hinge, wrap it around the spinner and glue in place. The counter balance and prop shaft are made of 1/16" piano wire.

Begin by shaping the hook, then pass the wire through the nose plug and spinner. Be sure to put a ball-bearing washer between the nose plug and spinner; bend the wire back along the spinner until it meets the propeller centerline. Then make a right angle bend, glue, cut the wire the required length, as shown on the plans.

You now attach the lead counter weight. To do this roll a piece of paper around a pencil and hold tightly in a vice while you pour lead into this tube. Place the wire into the lead while it is soft and mold lead to size shown on plans.

Testing

To test your model, hand glide the ship until it does not stall or dive. Keep adjusting the wing until the ship glides slightly to the right; then add a few winds to the motor to see how the model circles under power.

When you have found the proper adjustment this plane should give you plenty of exercise chasing it—as all our models of this design were lost on flights. Good luck!

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James Monroe, 15 years old, wins Second Annual Fresno, Calif. contest with Comet Sailplane, establishing high time of 20 minutes, 35 seconds for a single flight.

BAKERSFIELD, CALIFORNIA CONTEST

NAME	TIME	PLANE
Joe Menezes	2030 Sec.	Zipper
Ted Gillette	1143 "	"
Curtiss Dugan	1017 "	Mercury
Lester Haskall	900 "	Own
A. L. Buck	510 "	"
Van Tassell	408 "	Zipper
V. Kishue	399 "	Sailplane

LETTER FROM—Chas. VanDyke, Independence, Mo.
Gentlemen:
The first time I flew my Mercury was at a Topeka, Kansas contest. On an unofficial flight my plane flew out of sight after eighteen minutes in the air and I had to get a real airplane to find it. Two weeks later, Kansas City held a contest in which around 400 competed. I flew the same plane and won first place. A month later, the Winged Motor Club held a contest in which around 100 took part. I again won first place, my time being 23 minutes. This is the best little gas plane I have ever had and I sincerely want to congratulate you on such a wonderfully designed model as the Mercury.

RESULTS OF San Diego Aeroneers Sixth Annual Southwestern Championship Gas Model Airplane Meet.

1st—Walter Hauck, Sailplane, 22 min. 9 sec.
2nd—Ray Acord, Sailplane, 21 min. 22 sec.
3rd—Chas. Koby, Sailplane, 20 min. 49 sec.
4th—Bob White, Zipper, 18 min. 52 sec.
Seven out of the first ten places went to Comet models.

Richard Pittenger of San Francisco, Calif., established a new national record for Class "C" Jr. event with three flight average of 10 minutes 10.3 seconds, using a Zipper, powered with a Comet "35" motor.

LETTER FROM—Warren Lowe, Contest Director of Brookfield Balsa Bashers, Brookfield, Mo.
Gentlemen:
I wish to tell you about the remarkable flights that my fellow club members and myself have been getting from our Comet Zippers. My Zipper is about a year and a half old and is silk covered. In the last 40 flights, I have had 7 thermal out of sight flights. It has stayed up for one hour, 47 minutes, travelling 20 miles. Other thermal times are 48 minutes; 15 minutes; 1 hr. 15 min.; 12 min.; 28 min. and 30 minutes. The ship is powered by an Ohlsson "23", two years old. I recently tried a Forster 29 in it but both times the ship "left the country". The plane weighs 28½ ounces and has really taken a lot of punishment with only slight damage, due to proper design and construction. Several of the other club members have Zippers and Ohlsson "23 s" and their flight records are very similar to mine. Some of their times are 45 minutes; 1 hr. 30 minutes, 20 minutes, etc. Here's to Comet for their unequaled success in gas model design and construction.

LETTER FROM—Warren Weible, Defiance, Ohio.
Gentlemen:
I think you will be pleased to learn of another victory for your Sailplane. I took first at the Newhio Model Airplane meet held on October 20th at Dayton, Ohio. My first flight was 30 minutes official but the plane flew 26 minutes more before coming down. With the thermals gone, the plane turned in its next two official times of 4:18 and 4:17, giving a total official time of 38:35. I think that the Sailplane is the best model I've built. My Sailplane was powered by an Ohlsson "60". I would like to know if you are going to come out with a small Sailplane that could be powered by an Ohlsson "19".

Cliff Propst won first in Class "C" in the meet sponsored by the Arrowhead Aeronautics Club with a Sailplane. Time—17 minutes for one flight!

Bobby Davis, Jr. of Atlanta, Georgia, age 15, made the longest official time of 1940 when his Zipper flew 64 minutes on two flights establishing the national record.

LETTER FROM—Wm. A. Mulvoy, So. Norwalk, Conn.
Dear Sirs:
After reading all your testimonials about the performance of the Zippers and Sailplanes, I feel that I should tell you about the success I had with the Mercury. I built and flew two this past Summer and in every meet I entered, they outflew all other Class "B" ships, including Ohlsson "23" powered Zippers. On its best flight, it disappeared in the clouds after 36 minutes, using a 13½ second motor run. This flight gave me the national record in Class "B" open. In my estimation, the Comet Mercury is "tops".

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